



LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

Volume 5 | Technical Appendices

CFA14 | Newton Purcell to Brackley

Survey reports (CH-004-014)

Cultural heritage

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Department for Transport

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1 Introduction

1.1 Structure of the cultural heritage appendices

1.1.1 The cultural heritage appendices for the Newton Purcell to Brackley community forum area (CFA14) comprise:

- baseline reports (Volume 5: Appendix CH-001-014);
- a gazetteer of heritage assets (Volume 5: Appendix CH-002-014);
- an impact assessment table (Volume 5: Appendix CH-003-014); and
- survey reports (this appendix).

1.1.2 Maps referred to throughout the cultural heritage appendices are contained in the Volume 5, Cultural Heritage Map Book.

1.1.3 Where appropriate, sites or assets discussed within report have been cross referenced with the gazetteer of heritage assets (Volume 5: CH-002-014) via the unique identifiers, and can be viewed on maps CH-01-043b to CH-01-047a and CH-02-023 to CH-02-024 in the Volume 5, Cultural Heritage Map Book.

1.2 Surveys undertaken

1.2.1 This appendix contains the results of a series of archaeological surveys. These surveys comprised:

- a fully-integrated remote sensing survey incorporating light detection and ranging (LiDAR), hyperspectral imagery and aerial photographic analysis of the majority of the Proposed Scheme; and
- geophysical surveys at two locations along the route (site codes (from south to north): GOoAE and GOoAF), encompassing a total of approximately 24.4ha.

1.3 Surveys proposed but not undertaken

1.3.1 In addition to the surveys reported on in this document, a number of further locations within the Newton Purcell to Brackley study area were proposed for geophysical survey but due to access or other restrictions these surveys were not carried out. The locations of these proposed surveys are listed below:

- Site OPoAA: area to the west of Warren Farm, Finmere (National Grid reference: SP 62073 33138);
- Site GOoAC: area to the north of Bellabeg, Turweston (National Grid reference: SP 60463 37990);
- Site GOoAD: area to south of the A43, Brackley (National Grid reference: SP 59764 38829); and
- Site OUoAA: area to the west of Radstone (National Grid reference: SP 58507 40811).

2 Remote sensing survey report

2.1 Introduction

2.1.1 This report outlines the results of the archaeological remote sensing survey of CFA14. This was an archaeological survey involving the systematic analysis, interpretation, mapping and recording of archaeological sites from aerial photographs, hyperspectral imagery and LiDAR imagery.

2.1.2 The aim was to accurately map and record the form and extent of archaeological features visible as cropmarks, soilmarks, earthworks or structures on a range of different remote sensed imagery for the study area, in order to inform the baseline assessment of the cultural heritage resource.

The study area

2.1.3 The study area for this remote sensing survey covers the entire length of the Newton Purcell to Brackley study area, which falls across the junction of Northamptonshire, Buckinghamshire and Oxfordshire.

2.1.4 The study area generally comprised a 700m-wide strip centred on the route (350m either side of the centre line). This provided a buffer sufficient to offer contextual information for all recorded sites. Where the route boundary extended beyond the edge of the 700m-wide strip, the study area was expanded to the limit of the remote sensing survey boundary shown in Figures CH-004-14.01 to CH-004-14.10.

2.1.5 In total the archaeological remote sensing survey of the Newton Purcell to Brackley study area covered an area of 10.5km².

2.2 Methodology

Northamptonshire national mapping programme

2.2.1 The study area has previously been surveyed as part of the Northamptonshire national mapping programme^{1,2} which was undertaken between 1994 and 2001. It was originally intended that archaeological features already mapped and recorded by the Northamptonshire national mapping programme would not be re-transcribed. In practice, however, the very high resolution LiDAR data available to the current survey, in combination with refined aerial photograph rectification methodologies, meant that it was sometimes possible to record Northamptonshire national mapping programme documented features with a greater level of detail and accuracy. Where a potential archaeological feature differed significantly in detail, location or extent from the Northamptonshire national mapping programme mapping, it was re-transcribed.

2.2.2 In order to provide consistency with other similar datasets (namely English Heritage national mapping programme mapping), the archaeological remote sensing survey was carried out in broad accordance with the current version of the English Heritage national mapping

¹ Deegan, A., (1992), *Northamptonshire NMP Project: management report*, English Heritage and Northamptonshire County Council, Unpublished Report.

² Deegan, A. and Foard, G., (2007), *Mapping Ancient Landscapes in Northamptonshire*, English Heritage, Swindon.

	programme standards ³ . The interpretations applied to identified features are consistent with the preferred terms within the English Heritage <i>Monument Type Thesaurus</i> ⁴ .	
	Sources: modern aerial photographs	
2.2.3	High resolution (12.5cm) vertical aerial orthophotography taken specifically for the purposes of the Proposed Scheme was made available for this survey. This imagery was captured during 2012. It generally consists of a 700m-wide strip centred on the route, although it is slightly wider in some areas. It was viewed digitally within a geographical information system (GIS) program. The level of accuracy of the orthorectification is such that features mapped from this source should be within 15cm of true ground position.	2.2.8 The two vertical aerial photographs in the Cambridge University Collection of Aerial Photography archive which were examined for this study were taken in 2006. Vertical aerial photographs are unlikely to have been taken for archaeological purposes, but may have captured sites of historic interest incidentally, especially those shots taken in the first half of the 20th century before archaeological remains may have been damaged or destroyed by the intensification of arable farming.
2.2.4	Pre-existing vertical aerial orthophotography dating from the 1990s and 2000s was also made available. This was supplied under the Pan-Government Agreement. The resolution is 25cm. The level of accuracy of the orthorectification is such that features mapped from this source should be within 1.5m of true ground position ⁵ . This vertical imagery was also viewed on-screen within GIS.	2.2.9 All aerial photographs in the English Heritage and Cambridge University Collection of Aerial Photography archives which fell within the study area were viewed in person and examined stereoscopically and under magnification where applicable. Copies were obtained where potential archaeological features were identified and the relevant photographs were considered to be of use either for transcription or for reference purposes.
	Sources: Historic aerial photographs	Sources: LiDAR imagery
2.2.5	All readily-available historic vertical and oblique aerial photographs held in archives were also consulted. This included photographs held at the English Heritage Archive (formerly the National Monuments Record) and the Cambridge University Unit for Landscape Modelling. The latter is also referred to as the Cambridge University Collection of Aerial Photography.	2.2.10 High resolution LiDAR data acquired specifically for the purposes of the Proposed Scheme was made available for this survey. This data was captured in 2012. It generally consists of a 700m-wide strip centred on the route, although it is slightly wider in some areas.
2.2.6	To avoid unnecessary duplication, archival aerial photographs used in the Northamptonshire national mapping programme were not re-examined in the course of the present survey. This significantly reduced the number of aerial photographs included, as follows:	2.2.11 The resolution of the data supplied was 20cm. The level of accuracy of the orthorectification was such that features mapped from this source should be within 15cm of true ground position. The raster digital elevation model was viewed directly within GIS. The digital elevation model is LiDAR data that has been processed to provide a representation of the ground surface without objects such as vegetation or buildings. This means that archaeological earthworks can be revealed on the LiDAR imagery, even if they lie beneath areas of woodland ⁶ .
	<ul style="list-style-type: none"> • none of the 292 historic vertical aerial photographs of the study area in the English Heritage Archive post-date the Northamptonshire national mapping programme; • thirty-seven of the 119 historic oblique aerial photographs of the study area in the English Heritage Archive post-date the Northamptonshire national mapping programme and were therefore examined as part of the current survey; and • Two of the 64 historic vertical and oblique aerial photographs of the study area in the Cambridge University Collection of Aerial Photography archive post-date the Northamptonshire national mapping programme. 	Sources: hyperspectral imagery
2.2.7	The oblique aerial photographs in the English Heritage Archive which were analysed for this study were taken between 2004 and 2011 and usually targeted known sites of architectural or archaeological interest. They were typically taken at a much larger scale than the 'blanket' vertical aerial photography, and were often timed to capture images of archaeological sites when they were at their most visible, i.e. when dry ground conditions favoured the development of clear cropmarks, or when low winter sun would reveal subtle earthworks.	2.2.12 Hyperspectral imagery taken specifically for the purposes of the Proposed Scheme was made available for this survey. This imagery was captured in a series of runs during 2012 and provides a considerable buffer beyond the edge of the remote sensing survey study area boundary ⁷ .
		2.2.13 Thirty-four separate spectral band widths were captured, ranging from 406.075 nanometres to 992.065 nanometres. The band widths varied slightly between 16.280 nanometres at the lower end of the spectrum to 18.280 nanometres ⁸ . For each of the areas surveyed, varying combinations of three different bandwidths were analysed, with particular reference to bands 7–13 (882.725 nanometres to 773.255 nanometres) and bands 18–22 (683.435 nanometres to 612.185 nanometres), as these have been shown previously to be useful in archaeological remote sensing ⁹ .

³ Winton, H., (2012), *Standards for National Mapping Programme projects, Version 0.1 Draft*, English Heritage, Aerial Investigation and Mapping, Typescript document.

⁴ English Heritage; *NMR Monument Type Thesaurus*; http://thesaurus.englishheritage.org.uk/thesaurus.asp?thes_no=1; Accessed: August 2012–June 2013.

⁵ GeoStore; Aerial Photography RGB Product; <http://www.geostore.com/geostore4/WebStore?xml=geostore4/xml/productsAPRGB.xml>; Accessed: August 2013.

⁶ This can sometimes depend upon the time of year that the LiDAR imagery was captured.

⁷ The Newton Purcell to Brackley study area was covered by hyperspectral runs 15, 16, 17a, 17b, and 18.

⁸ Blom, (2012), *HS2 Hyperspectral Information*, BLOM Project Number: 03/037/12.

⁹ Powlesland, D., Lyall, J. and Donoghue, D. (1997), *Enhancing the record through remote sensing: the application and integration of multi-sensor, non-invasive remote sensing techniques for the enhancement of the Sites and Monuments Record*, *Internet Archaeology* 2; <http://dx.doi.org/10.11141/ia.2.4>; Accessed: 18/12/2012.

- 2.2.14 The hyperspectral imagery was viewed directly within GIS, as automated classification software does not work well with such high resolution data due to the prolifically varied response obtained from a single small area¹⁰.
- Sources: historic environment record data**
- 2.2.15 Data from the Northamptonshire, Oxfordshire and Buckinghamshire historic environment record (HER) were used as a reference to aid interpretation of features visible on remote sensed imagery, either through a pre-existing identification of a visible feature, or by providing information that could help characterise the likely cultural heritage resource of the area.
- 2.2.16 The data supplied covered the entirety of the Northamptonshire, Oxfordshire and Buckinghamshire areas, creating an ample buffer to provide contextual information for any archaeological sites of interest within the boundary of the remote sensing study area.
- Sources: national record of the historic environment data**
- 2.2.17 Monument data from the national record of the historic environment, held by English Heritage, was used as a reference to aid interpretation of features visible on remote sensed imagery, either through a pre-existing identification of a visible feature, or by providing information that could help characterise the likely cultural heritage resource of the area.
- 2.2.18 This data was supplied as points, lines and polygons with identifying attribute data attached. Full monument record reports were also supplied as a PDF document. The data covered a 10km-wide strip (5km each side of the route centre line), thereby providing an ample buffer beyond the boundary of the remote sensing study area.
- Sources: cartographic sources**
- 2.2.19 Historic Ordnance Survey (OS) mapping was supplied for the purposes of the project. The map tiles had been geo-referenced and were viewed digitally in GIS. Epochs 1–4 of the 1:2500 scale County Series maps, which typically date from 1898 onwards, were used as a reference to aid interpretation of features visible on the remote sensed imagery.
- 2.2.20 In general, where features such as field boundaries, trackways, extractive pits or ponds were marked on a historic OS map, they were not mapped and recorded as part of this survey. This is because the objective of this project was to add to the known record, not duplicate it. Nevertheless, where the full extent or form of a feature was not recorded in its entirety on the historic maps, it was included in the transcription for this project.
- Interpretation, rectification and mapping**
- 2.2.21 All vertical and oblique images from the sources identified above were systematically examined for any archaeological features visible as cropmarks, soilmarks, earthworks or structures. In accordance with best practice for remote sensing surveys, all available sources for each field or land parcel were viewed in conjunction in order to enable the most accurate interpretation possible.
- 2.2.22 Where archaeological features were visible on the LiDAR or aerial orthophotography, a detailed transcription, including all visible elements of the site in question, was carried out in ArcMap 10.1.
- 2.2.23 Where additional sites, features or details were visible on the historic aerial photographs from the English Heritage or Cambridge University Collection of Aerial Photography archives, these images were rectified using the computer program Aerial 5.33 prior to their import into ArcMap for transcription.
- 2.2.24 Digital OS MasterMap 1:1250 base maps were used to establish control points (it should be noted that even when 1:1250 scale data is obtained, the scale of the mapping for rural areas is only in fact 1:2500¹¹). Six or more control points were used for each photograph, with errors kept below 1m for each control point. This provided an accuracy of less than 1m to the base map for the rectified photographs.
- 2.2.25 A Digital Terrain Model (DTM) in the form of 5m point data was used in order to further refine the accuracy of the rectifications.
- 2.2.26 The OS advise that their 1:1250 scale MasterMap data has an accuracy of 0.5m root mean square error for urban areas, and 1.1m root mean square error for rural areas¹². Therefore, archaeological features transcribed from photographs rectified using this data will on average be accurate to within 1m–2m of their British national grid coordinates.
- 2.2.27 As already noted, in order to ensure consistency with other similar remote sensing datasets, this project was carried out in broad accordance with current national mapping programme standards and guidance. As such, the identified features were transcribed onto the standard national mapping programme drawing layers, using standard national mapping programme conventions¹³ as detailed in Table 1.

Table 1: Layers used in GIS for digital transcription of archaeological features¹⁴

Layer name	Colour	Description
Bank	Red	Defines the outline of positive features such as boundary banks or windmill mounds. Thin banks, or those too diffuse to define accurately are included on this layer as a single line.
Ditch	Green	Defines the outline of negative features such as boundary ditches or hollow ways. Thin ditches, or those too diffuse to define accurately are included on this layer as a single line.
Large cut feature	Blue	Defines the outline of sizeable negative features such as quarries or extractive pits.
Levelled R&F outline or direction	Magenta	Defines the outline of a single block of ridge and furrow (R&F) seen either as a cropmark, or an earthwork later known to have been levelled. An arrow within each single block indicates the direction of ploughing.
Extant R&F outline or direction	Cyan	Defines the outline of a single block of ridge and furrow seen as earthworks on the latest available remote sensed imagery.

¹¹ Ordnance Survey; Products and Services FAQs: How accurate are your products?; <http://www.ordnancesurvey.co.uk/oswebsite/support/products-services.html>; Accessed: June 2013.¹² Ordnance Survey.¹³ Winton, H., (2012).¹⁴ Table 1 based on Winton, H., (2012), Section 7.5. P31.

Layer name	Colour	Description
		An arrow within each single block indicates the direction of ploughing.
Extent of area	Grey	Defines the extent of large features such as the perimeters of WWII airfields and military camps.
T-hachure	Dark blue	Top of the 'T' defines the top of a slope or scarp edge such as a lynchet or house platform. Body of the 'T' indicates the length and direction of the slope.
Structure	Purple	Defines the extent of surviving buildings and structures such as individual WWII Nissen Huts and pillboxes. Thin structures such as walls or concrete paths are included in this layer as a single line.

- 2.2.28 Table 2 and Table 3 show period range and evidence range abbreviations used. The evidence abbreviations identify the form in which a feature is visible on the remote sensed imagery.
- 2.2.29 Information relating to each of the transcribed features was recorded in the ArcMap attribute table. This included details such as the interpretation of each feature and the remote sensed source they were transcribed from, as well as the HER and national record of historic environmental numbers for the features if applicable. These results have been set out in Table 4.

Table 2: Period range abbreviations used in the GIS attribute data

Period	Abbreviation	Date range
Neolithic	N	4,000 – 2,400 BC
Bronze Age	BA	2,400 – 700 BC
Iron Age	IA	700 BC – AD 43
Roman	RO	AD 43 – 410
Early medieval	EM	AD 410 – 1066
Medieval	MD	AD 1066 – 1540
Post-medieval	PM	AD 1540 to 1901
20 th century	C20	AD 1901 – 2000
World War II	WWII	1939 to 1945
Uncertain	UN	

Table 3: Evidence abbreviations used in the GIS attribute data

Evidence	Abbreviation
Cropmark (includes soilmarks)	C
Earthwork	E
Levelled earthwork	LE
Destroyed monument (i.e. quarried-away)	DM

Evidence	Abbreviation
Structure	S

- 2.2.30 The results of this remote sensing survey and transcription have been saved in the project ArcMap MXD and have been supplied with all of the additional required metadata attached. The results have also been exported as Esri shapefiles for ease of import into other GIS programs where necessary in compiling the baseline survey.

2.3 Limitations

- 2.3.1 In some areas, the 2012 LiDAR and aerial orthophotography did not extend to cover the latest revision of the route.
- 2.3.2 Where archaeological sites have been identified solely from remote sensed imagery without confirmation from archaeological excavation or supporting evidence in the form of find-spots, etc., it should be noted that the interpretation may be revised in the light of further investigation.
- 2.3.3 It should be stressed that the absence of an archaeological feature on remote sensed imagery does not confirm its absence in the ground, as visibility from the air is sometimes dependent upon a complex combination of factors. These include:
- unsuitable conditions at the time of image capture (such as lighting, ground moisture content and crops or other ground cover);
 - variable quality of photography;
 - underlying features being masked by alluvial build-up; and
 - areas where archaeological features either do not survive or have never existed.
- 2.3.4 During the survey 'steps' of approximately 2m were noted at several points in the purpose-flown 2012 vertical orthophotography where adjacent image tiles had been joined to provide continuous coverage of the route..
- 2.3.5 Archaeological features were not mapped beyond the boundary of the remote sensing survey study area, as the cumulative effect of this along the entire length of the route would have resulted in a significant increase in the study area. Where archaeological cropmarks, earthworks, soilmarks or structures continued beyond the study area boundary, this was noted in the attribute data of the mapped feature.
- 2.3.6 The hyperspectral imagery obtained for the purposes of the Proposed Scheme did not include spectral bands in the short-wave to mid-infrared/thermal wavelengths (2,080 nanometres – 13,000 nanometres), which have been shown in the past to be of particular use in assessing archaeological potential. The mid-infrared/thermal range is especially likely to reveal subtle cropmarks or soilmarks that are not strong enough to be detectable in the visible part of the spectrum, due to the fact it will display very slight differences in water content present within both vegetation and the ground¹⁵.

¹⁵ Powlesland, D., Lyall, J. and Donoghue, D., (1997).

2.4	Assumptions	
2.4.1	Information on the positional accuracy of the hyperspectral imagery has not been supplied. As such, it is assumed that the accuracy of the orthorectification of this source is at least as good as that of the Aerial 5.33 program outlined in Section 2.2 of this report – i.e. transcribed features will be accurate to within 1m–2m of true ground position.	2.5.9 The remote sensed imagery used to transcribe each individual feature is detailed in the source column.
2.5	Results: description	2.5.10 The description column is intended as a brief interpretation only, outlining the main features or points of note.
2.5.1	The primary output of the archaeological remote sensing survey of the Newton Purcell to Brackley study area is the detailed digital transcription of each identified potential archaeological feature. Information pertaining to the interpretation of these features is contained within the attribute data of every line and polygon drawn in GIS.	2.5.11 The full attribute table attached to every line and polygon transcribed as part of this survey contains additional columns not displayed in Table 4, such as the date the feature was transcribed and the initials of the member of staff responsible, etc.
2.5.2	Table 4 itemises in detail the results of the Newton Purcell to Brackley study area survey. These details originate from the GIS attribute data. The results should be read in conjunction with Figures CH-004-14.01 to CH-004-14.10 of this report.	
2.5.3	Where a single mapped feature has generated two lines of identical attribute data ¹⁶ , the duplicate line has been removed from Table 4. Where the transcription of a site or feature consists of several lines or polygons which may have been visible on different sources, or in a different form (i.e. where different elements of the site are visible as both cropmarks and earthworks), the differing lines of the attribute data table have been retained in order to reflect these variations.	
2.5.4	The aerial survey ID is the unique identifier applied to each site or feature transcribed during this project. It was not considered sufficient to use the automatically generated 'feature ID' within GIS, as this would result in a site which consisted of several different features represented by different lines and polygons having several different identifying numbers. The aerial survey ID was also used to group features, such as several interconnecting former field boundaries. This is consistent with the approach taken by English Heritage on national mapping programme projects ¹⁷ . The aerial survey ID is prefixed with a different sequential letter for each CFA. For the Newton Purcell to Brackley study area, it is the letter 'N'.	
2.5.5	The national record of historic environmental and HER columns detail the relevant monument numbers for these authorities, where such numbers exist for transcribed features.	
2.5.6	The period abbreviations used are set out in Table 2.	
2.5.7	As noted in Section 2.2.1 Error! Reference source not found. of this report, the interpretation types (detailed in the type column) comply with the preferred terms within the English Heritage Monument Type Thesaurus ¹⁸ in order to achieve consistency with other similar transcribed datasets.	
2.5.8	The evidence abbreviations refer to the physical nature of the recorded features. These abbreviations are set out in Table 3.	

¹⁶ Such as a block of ridge and furrow, which contains this information within both the polygon that defines its extent and the line indicating the direction of ploughing.

¹⁷ Winton, H., (2012)

¹⁸ English Heritage; NMR Monument Type Thesaurus.

Table 4: Exported GIS attribute data for each transcribed feature, detailing the interpretation applied

Aerial survey ID	National record of the historic environment	HER	Period	Type	Evidence	Source	Description
No1 (NPBoo6)	1333118	8922	RO / UN	Road / natural feature	E	HS2 LiDAR 2012	A possible part of the Towcester to Alchester Roman Road is very faintly visible as a linear bank. In isolation, this could be interpreted as a natural feature, but the presence of the existing records at this location means it requires highlighting.
No2	N/A	N/A	PM	Field boundary / boundary bank	C	Pan-Government Agreement SP6230 25-MAY-2004	A possible post-medieval field boundary is very faintly visible as a linear bank. It is visible as a slight earthwork on aerial photographs of 2004. Not on historic maps. Possible continuation from field to the north.
					E	Pan-Government Agreement SP6230 25-MAY-2004	A possible post-medieval field boundary is very faintly visible as a gently curving bank. It is visible as a slight earthwork on aerial photographs of 2004. Not on historic maps. Possibly continued in field to the south.
No3	N/A	N/A	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	A small area of ridge and furrow is visible as extant earthworks on modern LiDAR imagery. It is less well-preserved than some of the other nearby surviving examples.
					E / LE	Pan-Government Agreement SP6230 25-MAY-2004 / HS2 LiDAR 2012	Ridge and furrow visible on aerial photographs as extant earthworks appears to have been levelled by the time of the LiDAR. It originally continued to the south-west across the rest of the field, but this is beyond the boundary of this mapping project.
							Ridge and furrow visible on aerial photographs as faintly extant earthworks appears to have been levelled by the time of the LiDAR. It appears to skirt around a feature in the south-western corner that is marked on historic OS maps as a pond or pit.
No4	N/A	N/A	MD / PM	Ridge and furrow	E	Pan-Government Agreement SP6231 25-MAY-2004 / HS2 LiDAR 2012	Medieval or post-medieval ridge and furrow is visible as both extant and levelled earthworks on vertical aerial photographs and LiDAR. Several fields of ridge and furrow continue beyond the edge of the project boundary, but have not been mapped here.
					E / LE	HS2 Vertical Photography SP6331 2012	Medieval or post-medieval ridge and furrow is visible as both extant and levelled earthworks on vertical aerial photographs and LiDAR. Several fields of ridge and furrow continue beyond the edge of the project boundary, but have not been mapped here.
No5	N/A	N/A	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	A fragment of medieval or post-medieval ridge and furrow is visible as extant earthworks on recent LiDAR imagery. Aerial photographs of the same date appear to show ridge and furrow in a different direction, but these are just mowing lines in the garden
					E / LE	Pan-Government Agreement SP6230 25-MAY-2004 / HS2 LiDAR 2012	Ridge and furrow visible on aerial photographs as faintly extant earthworks appears to have been levelled by the time of the LiDAR of 2012.
No6 (NPBo92, NPBo93)	N/A	N/A	MD / PM	Ridge and furrow	E	Pan-Government Agreement SP6231 25-MAY-2004 / HS2 Vertical Photography SP6231 2012 / HS2 LiDAR 2012	Medieval or post-medieval ridge and furrow is visible as earthworks on aerial photographs and LiDAR. It is not as well-preserved as some of the nearby fields of ridge and furrow. Several fields of ridge and furrow continue beyond the edge of the project boundary, but have not been mapped here.
No7	N/A	N/A	PM	Field boundary / boundary bank	C	HS2 Vertical Photography SP6231 2012 / Pan-Government Agreement SP6231 25-MAY-2004	Possible post-medieval field boundaries are visible on aerial photographs as linear and curvilinear ditch cropmarks.
No8	N/A	N/A	MD / PM	Ridge and furrow	C	HS2 Vertical Photography SP6231-6321 2012	Medieval or post-medieval ridge and furrow is visible as a cropmark on vertical aerial photographs of 2012.
						Pan-Government Agreement SP6331 25-MAY-2004	A small area of possible ridge and furrow is visible on vertical aerial photographs of 2004 as a cropmark. The classic 'reverse-s' shape is clearly visible.
					E	HS2 LiDAR 2012	Ridge and furrow is faintly visible as slightly extant earthworks on modern LiDAR imagery. It likely continues into the north-eastern corner of the field, but LiDAR coverage stops at the project boundary.

Aerial survey ID	National record of the historic environment	HER	Period	Type	Evidence	Source	Description
N09	N/A	N/A	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	Ridge and furrow is visible as extant earthworks in a corner of a field on the edge of the project area. It is likely that it continues in the rest of the field to the south-west, but LiDAR coverage stops at the project boundary.
N10	N/A	N/A	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	Two small areas of ridge and furrow are visible on modern LiDAR imagery as extant earthworks beneath a patch of woodland.
N11	N/A	N/A	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	Ridge and furrow is visible as extant earthworks in a corner of a field on the edge of the project area. It is likely that it continues in the rest of the field to the south-west, but LiDAR coverage stops at the project boundary.
					E / LE	Pan-Government Agreement SP6331 25-MAY-2004 / HS2 LiDAR 2012	Ridge and furrow visible on aerial photographs as extant earthworks appears to have been levelled by the time of the LiDAR. It originally continued to the south-west across the rest of the field, but this is beyond the boundary of this mapping project.
N12	N/A	N/A	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	An area of ridge and furrow is visible on modern LiDAR imagery as extant earthworks beneath a small area of woodland called Widmore Plantation. It may continue to the south-west, but our LiDAR coverage stops at the edge of the project boundary.
N13	N/A	N/A	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	A long narrow strip of ridge and furrow is visible on LiDAR images as extant earthworks. It appears to be slightly degraded at the southern end, where it is under trees.
							Extant ridge and furrow is visible on LiDAR imagery under a small patch of trees as well as to the south and north of them. The area to the north of the trees is not as well-preserved as the other areas.
							Extant ridge and furrow with degraded condition in north-western corner, and at southern end where it is covered by trees. Small 'cutout' patch approximately halfway up is likely to be an old extractive pit or pond, such as the ones to the east and north.
							Ridge and furrow is visible as extant earthworks on LiDAR images. It is likely that the ridge and furrow continues to the north-east, but the LiDAR coverage stops at the project boundary.
N14	N/A	N/A	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	An area of possible ridge and furrow is visible as extant earthworks on LiDAR images. The ridges and furrows are of irregular width. It is likely to continue to the north-east, but LiDAR coverage stops at the project boundary.
N15	N/A	N/A	PM	Steam-ploughed rig	C	HS2 Vertical Photography SP6233 2012	Possible post-medieval steam-ploughed rig is visible as both extant earthworks and cropmarks. The ridges are much narrower and more regular than nearby examples of medieval/post-medieval ridge and furrow.
					E	HS2 LiDAR 2012	Possible post-medieval steam-ploughed rig is visible as both extant earthworks and cropmarks. The ridges are much narrower and more regular than nearby examples of medieval/post-medieval ridge and furrow.
N16	N/A	N/A	PM	Trackway	C	Pan-Government Agreement SP6134-SP6234 24-MAY-2004	A possible former trackway is visible as a dark linear cropmark. It continues to the north-east, beyond the edge of the project boundary. It appears to lead towards a trackway marked on the 1881 1st Edition OS map of Oxfordshire, in the field to the north.
N17	N/A	N/A	PM / C20	Trackway	C	HS2 Vertical Photography SP6134 2012	Fragments of linear ditch indicate possible trackways. Area marked as Sanfoin Corner Plantation on OS 1900 and 1922 maps, so may alternatively be result of tree clearance. Mottled cropmarks just to the east are probable tree clearance or geological marks.
N18 (NPB044)	N/A	N/A	MD / PM	Ridge and furrow	E	Pan-Government Agreement SP6135 06-AUG-2005	Ridge and furrow is clearly visible as fairly well-preserved earthworks. Some of the mapped fields continue beyond the edge of the project boundary.
						Pan-Government Agreement SP6135 06-AUG-2005 / HS2 LiDAR 2012	Ridge and furrow visible as extant earthworks. Continues beyond the project boundary in the north-eastern corner of the field. Cut by modern activity, possibly quarrying or agriculture, at the eastern end.
							Ridge and furrow is faintly visible on modern LiDAR imagery as extant earthworks. It is much less well-preserved than in adjacent fields to the north and east.

Aerial survey ID	National record of the historic environment	HER	Period	Type	Evidence	Source	Description
N19 (NPBog8)	N/A	N/A	MD / PM	Field boundary / boundary bank	E	HS2 LiDAR 2012	A probable former field boundary bank is very faintly visible on LiDAR as an extant earthwork. Not on historic OS maps. Appears to border an area of ridge and furrow to the east.
				Ridge and furrow	E	HS2 LiDAR 2012	A single field of ridge and furrow is faintly visible as very slightly extant earthworks on LiDAR imagery. The south-western corner runs beyond the project boundary.
					E / LE	Pan-Government Agreement SP6135 06-AUG-2005 / HS2 LiDAR 2012	Ridge and furrow visible as faintly extant earthworks on aerial photographs appears to have been levelled by the time of the 2012 LiDAR.
N20	N/A	N/A	UN	Geological marks / ditched enclosure / pit	C	Pan-Government Agreement SP6236 02-SEPT-2004	Cropmarks visible on 2004 aerial photographs seem most likely to be geological marks, but the possibility that they may represent pits and parts of a ditched enclosure cannot be ruled out. No features diagnostic enough to enable a date estimate.
N21	N/A	N/A	MD / PM	Ridge and furrow	C	HS2 Vertical Photography SP6136 2012	Two areas of levelled ridge and furrow are faintly visible as cropmarks on vertical aerial photography of 2012.
N22	N/A	N/A	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	Several small areas of ridge and furrow are visible as extant earthworks. Three are likely to continue to the south-west, beyond the project boundary.
N23	N/A	N/A	MD / PM	Field boundary / boundary bank	E	HS2 LiDAR 2012	Possible field boundary bank visible as extant earthwork. Appears to continue to the north in the next field (marked on 1st Edition OS), and turn to east at its southern end to join section in next field.
							Possible field boundary bank visible as extant earthwork. Not on historic OS maps. Appears to lead towards a section of bank in the field to the west, which turns a corner to meet it.
N24	N/A	N/A	MD / PM	Ridge and furrow	C	HS2 Vertical Photography SP6037-SP6137 2012	Ridge and furrow is visible as cropmarks on vertical aerial photography of 2012. It is likely to continue across the remainder of the field to the north-east.
							Two areas of levelled ridge and furrow are faintly visible as cropmarks on vertical aerial photography of 2012.
					E	HS2 LiDAR 2012	A small patch of ridge and furrow is visible on LiDAR imagery as extant earthworks beneath a small patch of woodland in the corner of a field. It appears to be slightly degraded.
							The south-western corner of a field of ridge and furrow is visible on LiDAR imagery as extant earthworks. It is likely to continue to the north-east, beyond the project boundary.
							Ridge and furrow is visible as faintly extant earthworks on vertical aerial photographs. This corner of the field is now a patch of woodland, and LiDAR coverage of 2012 suggests no trace of the ridge and furrow survives beneath it.
					E / LE	Pan-Government Agreement SP6135 06-AUG-2005 / HS2 LiDAR 2012	Ridge and furrow visible as faintly extant earthworks on aerial photographs appears to have been levelled by the time of the 2012 LiDAR. It appears to be cut by a possible later trackway.
							Visible on aerial photographs as earthworks. Appears to be levelled by time of the LiDAR. Aerial photograph shows it continues across the rest of the field to the north-east, beyond the project boundary.
N25	N/A	N/A	MD	Field boundary / boundary bank	E	HS2 LiDAR 2012	Linear bank visible on LiDAR as faintly extant earthwork in area beneath trees. LiDAR shows medieval/post-medieval ridge and furrow goes over the top of it. Cut in two places by edge of landscape park tree bed.
				MD / PM / UN	Trackway	C	HS2 Vertical Photography SP6036 2012
N26	N/A	N/A	MD / PM	Field boundary / boundary bank	E	Pan-Government Agreement SP6135 06-AUG-2005 / HS2 LiDAR	A possible field boundary bank is very faintly visible on aerial photographs. Presence confirmed by LiDAR, which shows an extremely faintly extant earthwork. Not on historic OS maps.

Aerial survey ID	National record of the historic environment	HER	Period	Type	Evidence	Source	Description
						2012	
N27 (NPBo60, NPBo61)	N/A	N/A	MD / PM	Ridge and furrow	C	Pan-Government Agreement SP6037 02-SEPT-2004	Ridge and furrow is faintly visible as cropmarks on vertical aerial photographs of 2004.
					E	HS2 LiDAR 2012	A small area of ridge and furrow is visible on LiDAR as extant earthworks in the south-western corner of a field on the edge of the project boundary. It may continue to the north-west, beyond the LiDAR coverage.
							Ridge and furrow is visible across a series of paddocks. A number of narrow linear earthwork banks appear to overlie the ridge and furrow on the same alignment as the current paddocks. It is thought these are earlier modern paddock divisions.
							Ridge and furrow is visible on LiDAR as slightly extant earthworks. The ridges and furrows are significantly wider than other nearby surviving examples. Both the wide and narrow examples show the diagnostic 'reverse-s' shape.
N28 (NPBo60, NPBo61)	N/A	N/A	MD / PM	Ridge and furrow	C	Pan-Government Agreement SP6037 02-SEPT-2004	Ridge and furrow is visible as cropmarks on vertical aerial photographs of 2004. It continues into the south-western corner of the field, beyond the project boundary.
					E	HS2 LiDAR 2012	Ridge and furrow is clearly visible on LiDAR as well-preserved extant earthworks.
							Ridge and furrow is visible on LiDAR as extant earthworks in several different areas in the fields surrounding Turweston Glebe.
N29 (NPBo99)	N/A	N/A	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	A narrow strip of ridge and furrow is visible as earthworks on the far eastern side of a field with a river at its western boundary.
							A small patch of heavily-degraded ridge and furrow is just visible on LiDAR as extant earthworks in what appears to be part of an enlarged garden on the edge of Turweston.
							A small patch of poorly-preserved ridge and furrow is visible as earthworks on LiDAR.
							Ridge and furrow is faintly visible on LiDAR as slightly extant earthworks.
							Ridge and furrow is faintly visible on LiDAR as slightly extant earthworks. Heavily degraded.
							The ridge and furrow here has wider, flatter ridges than other nearby surviving examples. The appearance of ridge and furrow does sometimes vary, but this example may be due to later re-use as allotment plots as detailed on the 1st Edition OS map.
N30	N/A	N/A	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	A small area of ridge and furrow is visible as earthworks on the edge of the project area. It is likely to continue to the east, beyond the project boundary.
N31 (NPBo62)	N/A	N/A	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	Ridge and furrow is visible on LiDAR as extant earthworks.
N32	N/A	N/A	MD / PM	Ridge and furrow	C	Pan-Government Agreement SP6038 05-SEPT-2004	A small area of ridge and furrow is visible as cropmarks at the edge of the project area. It continues to the east, beyond the project boundary.
N33	1430867	N/A	WWII	Airfield	C	HS2 Vertical Photography SP6038 2012	A hardstanding trackway is visible as a light cropmark leading from the perimeter track of Turweston Airfield. LiDAR shows the trackway sits within a slight cut towards its south-western end. There is a roughly rectangular depression at the end of the track.
					L	HS2 LiDAR 2012	A hardstanding trackway is visible as a light cropmark leading from the perimeter track of Turweston Airfield. LiDAR shows the trackway sits within a slight cut towards its south-western end. There is a roughly rectangular depression at the end of the track.
N34	N/A	N/A	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	Ridge and furrow is faintly visible on LiDAR as extant earthworks.
N35	N/A	5473/0/5	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	Ridge and furrow faintly visible on LiDAR as extant earthworks, in some places beneath patches of woodland. Cut by the

Aerial survey ID	National record of the historic environment	HER	Period	Type	Evidence	Source	Description
							ditches demarcating the tree beds of the landscape park, as well as paths within it.
							Ridge and furrow very faintly visible as extant earthworks on LiDAR, beneath a patch of trees. More heavily degraded than the ridge and furrow just to the east, which it is a continuation of.
N36	N/A	5473/o/6	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	Ridge and furrow is visible as earthworks on LiDAR. The field is bordered by a stream on its western side. The ridge and furrow occupies a higher terrace of land on the eastern side of the field.
					E / LE	Pan-Government Agreement SP6135 o6-AUG-2005 / HS2 LiDAR 2012	Ridge and furrow is visible as extant earthworks on LiDAR.
N37	N/A	5568/1 / 5568/1/5	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	Ridge and furrow is visible on LiDAR as earthworks. Truncated to the west by the A43.
					E / LE	Pan-Government Agreement SP6135 o6-AUG-2005	Ridge and furrow is visible on LiDAR as extant earthworks. Visible on both sides of the A43, at the junction with Northampton Road.
					E	HS2 LiDAR 2012	An area of ridge and furrow is visible on vertical aerial photographs as extant earthworks. This area is now a roundabout on the A43.
N38	N/A	5568/1 / 5568/1/5	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	Ridge and furrow is visible as extant earthworks on LiDAR. Truncated to the east by the A43.
					E	HS2 LiDAR 2012	Ridge and furrow is visible on LiDAR as extant earthworks. Visible on both sides of the A43, at the junction with Northampton Road.
N40	N/A	N/A	MD / PM	Ridge and furrow	C	HS2 Vertical Photography SP6038 2012	A small area of levelled ridge and furrow is visible as cropmarks. Possibly continues to the south-east, beyond the project boundary.
					E	HS2 LiDAR 2012	A small area of ridge and furrow is faintly visible as earthworks on LiDAR. It is likely to continue to the east, beyond the project boundary.
N41	N/A	N/A	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	A narrow strip of ridge and furrow is visible in a field adjacent to the river. It appears to occupy a slightly higher platform of land on the side of the field away from the river.
N42 (NPB063, NPB066)	N/A	N/A	PM / C20	Water meadow / drainage system	E	HS2 LiDAR 2012 / HS2 Vertical Photography SP6038 2012 / Pan-Government Agreement SP6038 o5-SEPT-2004	Possible bedwork water meadows are visible as interconnecting networks of banks and ditches across fields adjacent to the river. They do not form the recognisable herring-bone pattern in plan. May be post-medieval or modern in date. Not marked on historic OS maps. Some areas are much less convincing than other possible water meadows in nearby fields to the south-west. May be natural drainage.
N43	N/A	N/A	MD / PM	Field boundary / ridge and furrow	E	HS2 Vertical Photography SP6038 2012	Possible former field boundaries are extremely faintly visible as extant earthworks within what appears to be a racecourse. Not marked on historic OS maps. May alternatively be the last remaining fragments of ridge and furrow.
N44	N/A	N/A	PM / C20	Water meadow / drainage system	E	HS2 LiDAR 2012	A network of interconnecting ditches may be the remains of a bedwork water meadow. Alternatively, they may be a later drainage system. No banks are visible. Proximity to the river suggests the water meadow interpretation.
N45 (NPB100)	N/A	N/A	MD / PM	Strip lynchets / geological marks	C	Pan-Government Agreement SP6135 o6-AUG-2005	A series of wide linear banks are visible as very slightly extant earthworks. Their closely-spaced parallel arrangement, as well as their location along the contours of a slope, suggests they are strip lynchets, rather than field boundary banks.
					E	HS2 LiDAR 2012	
					E	HS2 LiDAR 2012 / HS2 Vertical Photography SP6039 2012	
N46	N/A	N/A	MD / PM	Field boundary /	E	HS2 LiDAR 2012 / HS2 Vertical	A thin linear bank is visible on LiDAR as an extant earthwork leading down the slope, parallel to the modern/current field

Aerial survey ID	National record of the historic environment	HER	Period	Type	Evidence	Source	Description
				boundary bank		Photography SP6039 2012	boundary. Possibly a former field boundary.
N47	N/A	422	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	A small area of ridge and furrow is visible on LiDAR as extant earthworks. It is likely to continue to the east, beyond the edge of LiDAR coverage and the project boundary.
N48	N/A	N/A	MD / PM	Field boundary / boundary bank	E	HS2 LiDAR 2012	A wide linear bank is very faintly visible on LiDAR as an extant earthwork. Its considerable width is likely to be due to centuries of plough-spreading. Probable former field boundary (aligned with one to the north-east). Not marked on historic OS maps.
N49	N/A	N/A	PM	Trackway	E / LE / C	Pan-Government Agreement SP6039 05-SEPT-2004 / HS2 LiDAR 2012	A possible former trackway is visible as a thin linear earthwork at its northern end on Pan-Government Agreement photos, and as a cropmark for the remainder. LiDAR indicates the earthwork part seems to have been levelled.
N50	N/A	N/A	MD / PM	Ridge and furrow	C	Pan-Government Agreement SP6039 05-SEPT-2004	Levelled ridge and furrow is visible as cropmarks on vertical aerial photographs. The circular/oval gaps are likely to be extractive/quarry pits, though they are not marked on historic OS maps.
							Levelled ridge and furrow is visible as a cropmark. Later LiDAR indicates that there is no earthwork element remaining. Continues to the north-east, but this is beyond the project boundary and cannot therefore be mapped as part of this project.
N51	338986	156/1	MD	Windmill mound	E / C	HS2 LiDAR 2012 / HS2 Vertical Photography SP5939 2012 / Pan-Government Agreement SP5939 05-SEPT-2004	Windmill mound visible on LiDAR as a slight earthwork mound and on aerial photographs as a light cropmark. The surrounding ditch was mapped as part of the Northamptonshire national mapping programme, but was not visible on any of the sources available for the current project.
N52	N/A	154	RO	Settlement	C	HS2 Vertical Photography SP5938 2012	Narrow linear ditches are visible across an area associated with finds of Roman date. Geology also visible as cropmarks, which along with strong linear agricultural marks in this arable field, means that further detail might have been masked.
N53	N/A	5568/1	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	A small area of ridge and furrow is visible as earthworks in a narrow strip of field adjacent to a stream. The ridge and furrow is visible in an irregularly-shaped polygon, which may represent partial levelling in some areas.
							Ridge and furrow is very faintly visible as earthworks on LiDAR. There are two completely levelled areas on the north-eastern side of the field, perhaps representing the sites of former buildings.
N54	N/A	N/A	MD / PM	Ridge and furrow	C	Pan-Government Agreement SP5939 05-SEPT-2004	Levelled ridge and furrow is visible on a vertical aerial photograph as cropmarks. A gap represents an old quarry pit marked on the 1st Edition OS map of 1884.
						HS2 Vertical Photography SP5939 05-SEPT-2004	Ridge and furrow is visible as faint cropmarks on aerial photographs.
						Pan-Government Agreement SP5939 05-SEPT-2004	
N55	N/A	5568/1	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	Ridge and furrow is visible on LiDAR as extant earthworks. It is likely to continue to the south-west, beyond the limit of both the LiDAR coverage and the project boundary.
N56	N/A	N/A	IA	Circular enclosure / ditched enclosure	C	Pan-Government Agreement SP5839 05-SEPT-2004	Possible penannular enclosure with narrow entrance to the south-east. Photos of the field from 2012 show mycelium rings nearby. The possible enclosure is not like these, and is much more similar in form to the Iron Age settlement enclosures that lie just to the west (HER: 6986).
N57	N/A	5568/1	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	A small area of ridge and furrow is visible as extant earthworks on LiDAR. It is likely to continue to the south-west, beyond the edge of both the LiDAR coverage and the project boundary.

Aerial survey ID	National record of the historic environment	HER	Period	Type	Evidence	Source	Description
N58	N/A	N/A	MD / PM	Ridge and furrow	E	HS2 Vertical Photography SP5839 2012	A small area of ridge and furrow is just visible as earthworks on aerial photographs, in the south-eastern corner of a field.
N59	N/A	N/A	MD / PM	Ridge and furrow	C	HS2 Vertical Photography SP5839 2012	Levelled ridge and furrow is visible on the western side of the railway line as cropmarks on aerial photographs.
					E	HS2 Vertical Photography SP5839 2012	Ridge and furrow is visible on aerial photographs as earthworks within a small field or paddock.
N60	N/A	N/A	MD / PM	Ridge and furrow Ridge and furrow Ridge and furrow	C	HS2 Hyperspectral 2012 (Run 17 Bands 6, 8, 10)	Levelled ridge and furrow is very faintly visible as cropmarks in the small field to the north of Hall Farm. The ridge and furrow cropmarks continue in the adjacent field, where they are visible on aerial photographs.
						HS2 Vertical Photography SP5839 2012	Ridge and furrow is visible as cropmarks. Crossed by two possible field boundary banks (N61), which may be later as they survive as earthworks.
						HS2 Vertical Photography SP5839, 5840, 5938, 5940 2012	Ridge and furrow is visible as cropmarks across a large field. Several different directions of ploughing are visible.
N61	N/A	N/A	MD / PM	Field boundary / boundary bank	E	HS2 LiDAR 2012	Two possible field boundary banks are faintly visible on LiDAR. They cross an area of ridge and furrow (N60) visible on photographs as cropmarks. The banks probably post-date the ridge and furrow, as they survive as earthworks..
N62	N/A	N/A	MD / PM	Ridge and furrow	C	HS2 Hyperspectral 2012 (Run 17 Bands 6, 8, 10)	Levelled ridge and furrow is visible on hyperspectral imagery as cropmarks. It is visible within the rest of this field as extant earthworks.
						HS2 LiDAR 2012	Ridge and furrow is visible on LiDAR as extant earthworks. Likely to extend beyond the project boundary to the south-west. Preservation varied across the mapped area.
							Ridge and furrow is visible on LiDAR as extant earthworks. Partly beneath area of trees. Preservation varies across the mapped area.
N63	N/A	N/A	MD / PM	Ridge and furrow	C	HS2 Vertical Photography SP5740, 5840 2012	A considerable expanse of levelled ridge and furrow is visible as cropmarks. It extends across two large modern arable fields. Likely to continue beyond project boundary on north-eastern side.
							A substantial area of levelled ridge and furrow is visible as cropmarks across what is now a large, modern, arable field.
							Levelled ridge and furrow is clearly visible as cropmarks on vertical aerial photographs. Several different ploughing directions are evident across what is now one large modern field.
							Levelled ridge and furrow is faintly visible as cropmarks on aerial photographs. It is likely to continue a slightly further to the north-east, but the aerial photography coverage stops at the study area boundary.
N64	339405	279	MD	Field boundary / boundary bank	E	HS2 LiDAR 2012	Two linear banks likely to have been former field boundaries are faintly visible on LiDAR as extant earthworks. Not recorded on historic OS maps.
N65	N/A	9892/0/1 / 279	MD / PM	Ridge and furrow	E	HS2 LiDAR 2012	A small area of ridge and furrow is just visible on LiDAR when the hillshade effect is turned off.
							Ridge and furrow is visible at Radstone as well-defined extant earthworks.
N66 (NPBo8g)	339405	279	MD	Deserted settlement	E	HS2 LiDAR 2012	Area of deserted settlement visible as extant banks on LiDAR. A few coincide with features marked on OS 1st Edition map of 1884 and previous national mapping programme survey.
N67	N/A	N/A	MD / PM	Ridge and furrow	C	HS2 Vertical Photography SP5840 2012	Levelled ridge and furrow is faintly visible as cropmarks on aerial photographs. It is likely to continue further to the north-east, beyond the project boundary.
N68	N/A	N/A	BA	Circular enclosure / ditched enclosure	C	NMR SP6233-8 NMR23673-5 29-JUL-2004	Possible circular settlement enclosure surrounded by associated enclosure ditches. Circular element may alternatively be a round barrow, but associated ditches suggest settlement rather than funerary monument. See also HER 13468, 16937.

Aerial survey ID	National record of the historic environment	HER	Period	Type	Evidence	Source	Description
				Ditched enclosure			Cropmarks of possible ditched enclosure with internal divisions/features including a circular ditched enclosure. One ditch continues beyond the project boundary. Further ditch cropmarks in northern part of field.
N69	N/A	N/A	MD / PM	Ridge and furrow	E / LE	HS2 Vertical Photography SP6037 2012 / HS2 LiDAR 2012	Ridge and furrow visible on aerial photographs as extant earthworks appears to have been levelled by the time of the LiDAR. It originally continued to the east, across the rest of the field, beyond the project boundary.
N70	N/A	N/A	PM / C20	Extractive pit	E / C	HS2 LiDAR 2012 / HS2 Vertical Photography SP6037 2012	Three probable extractive pits of post-medieval or modern date. Not likely to be associated with the construction of the airfield just to the north (English Heritage record 1430867), due to their comparatively small scale. Not on historic OS maps.
N71	N/A	N/A	MD / PM	Ridge and furrow	C	HS2 Hyperspectral 2012 (Run 18 Bands 6, 8, 10)	A possible field of levelled ridge and furrow is very faintly visible as cropmarks on hyperspectral imagery. Numbered differently to the adjacent fields of ridge and furrow, as it was added to the transcription at a later date.
N72	N/A	N/A	MD / PM	Strip lynchet / geological marks	E	HS2 LiDAR 2012	A series of wide linear banks is visible as very slightly extant earthworks. Their closely-spaced parallel arrangement, as well as their location along the contours of a slope. suggests they are strip lynchets, rather than field boundary banks

2.6 Results: interpretation

- 2.6.1 Seventy-two possible archaeological features were recorded from the remote sensed imagery that was surveyed as part of this project.
- 2.6.2 The majority of the features identified are thought to originate from the medieval or post-medieval periods and relate mostly to agriculture (predominately ridge and furrow cultivation and former field boundaries). Sites dating from between the Bronze Age and the 20th century were also recorded.
- 2.6.3 The possible Bronze Age feature consists of a ditched circular enclosure visible as a cropmark (N68). It has not been recorded in either the HER or national record of the historic environment. It appears to sit within a network of possibly contemporary outer enclosure ditches, and as such a settlement rather than funerary interpretation has been proposed. It is also possible, however, that some of the other cropmarks represent the underlying geology of the area. In that case the features visible on the remote sensed imagery may alternatively represent the ring ditch of a Bronze Age round barrow.
- 2.6.4 The survey also recorded a possible Iron Age penannular enclosure (N56). It has not been previously recorded in the HER or the national record of the historic environment. Although some aerial photographs of this field show fungus rings (mycelium, also known as 'fairy rings'¹⁹) marks nearby, this cropmark is more clearly defined. It is similar in appearance to some of the enclosure cropmarks previously recorded in a field to the west, beyond the boundary of the study area (HER 6986).
- 2.6.5 The Northamptonshire HER recorded possible Romano-British settlement and/or funerary activity across several fields on the north-eastern side of Brackley (HER 154). The remote sensed sources revealed linear and rectilinear cropmarks (N52) at this location which may represent the remains of former settlement from this period. The underlying geology was also visible as cropmarks, however, along with strong linear agricultural marks. It is therefore possible that further detail may have been masked or the interpretation confused.
- 2.6.6 The survey recorded a possible fragment of the Roman road between Towcester and Alchester (No1, NPBoo6). The 2012 LiDAR reveals a very faintly extant stretch of wide linear bank on the recorded line of the former Roman road. It is possible that this may alternatively be a former field boundary bank or even a natural feature, but the possibility that it represents the almost plough-levelled remains of the central agger of the Roman road cannot be overlooked.
- 2.6.7 A medieval windmill mound previously mapped by the Northamptonshire national mapping programme project was re-transcribed as part of this survey (N51). This was done to increase the accuracy of the recorded location and to remove some of the ambiguity of the previous transcription. The remote sensed sources examined as part of this survey showed a light solid circular cropmark indicating the site of a former windmill mound. The LiDAR evidence supported this, showing a slightly extant mound at this location. The associated features mapped during the Northamptonshire national mapping programme were either not visible on the sources consulted for this survey or were already recorded with sufficient accuracy.

- 2.6.8 The Northamptonshire national mapping programme project had previously recorded an area of possible deserted medieval settlement at Radstone (N64). The high resolution of the 2012 LiDAR imagery revealed further previously unrecorded earthwork features in the small field on the western side of Manor Farm. The remainder of the previously recorded features were not re-transcribed as a part of this survey.
- 2.6.9 The survey has recorded an extensive network of interconnecting ditches (N42 (NPBo63, NPBo66), N44) in the fields to either side of the River Great Ouse between Turweston and Whitfield. Although not in the classic 'herring-bone' form²⁰, it is possible that they constitute a series of post-medieval bedwork water meadows. Some of the features of this system may alternatively be either natural drainage channels or later drainage ditches.
- 2.6.10 Cropmarks indicating the former site of a trackway and an area of hard-standing (N33) are visible to the south of Whitfield on the edge of the study area. These features are likely to have been part of the system of dispersal or storage areas around the perimeter of Turweston Airfield, which was operational during World War II.
- 2.6.11 The survey recorded a series of cropmarks on the northern side of Westbury (N20) that have been extremely tentatively interpreted as indicating the possible site of a ditched enclosure. No date of origin has been proposed as the form of the cropmarks is so fragmentary and esoteric. It is possible that they represent the underlying geology. Nevertheless they are so strongly visible on aerial photographs and display a slightly rectilinear arrangement, so a possible archaeological origin cannot be discounted.

2.7 Conclusions

- 2.7.1 Seventy-two individual or grouped possible archaeological features were identified by the survey, 58 of which are not recorded in either the HER or the national record of the historic environment.
- 2.7.2 The identified features comprise in the most part the remains of medieval or early post-medieval agriculture (predominately ridge and furrow cultivation and former field boundaries). Other features of note include:
- a possible Bronze Age settlement enclosure or round barrow (NPBo19);
 - a possible fragment of Roman road (NPBoo6);
 - a medieval windmill mound;
 - post-medieval bedwork water meadows (NPBo63 and NPBo66); and
 - a small feature associated with Turweston Airfield.

¹⁹ Wilson, D., (2000) *Air Photo Interpretation for Archaeologists*, Tempus Publishing Ltd, Stroud. P191-2.

²⁰ Brown, G., (2005) *Irrigation of Water Meadows in England*. Památky Archeologické - Supplementum 17, Ruralia 5. P.88

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3.1 Historic aerial photographs consulted

Table 5: English Heritage oblique aerial photographs consulted for the remote sensing survey of the Newton Purcell to Brackley study area

English Heritage photo reference	Film number	Original frame number	Date taken
SP 6033 / 15	NMR 24487	/ 01	29 November 2006
SP 6033 / 16	NMR 24487	/ 05	29 November 2006
SP 6033 / 17	NMR 24487	/ 12	29 November 2006
SP 6033 / 2	NMR 18926	/ 29	14 November 2000
SP 6033 / 22	NMR 24487	/ 17	29 November 2006
SP 6033 / 23	NMR 24487	/ 18	29 November 2006
SP 6033 / 24	NMR 24487	/ 19	29 November 2006
SP 6033 / 25	NMR 24487	/ 20	29 November 2006
SP 6033 / 28	NMR 24487	/ 23	29 November 2006
SP 6033 / 29	NMR 24487	/ 24	29 November 2006

SP 6033 / 30	NMR 24487	/ 25	29 November 2006
SP 6034 / 2	NMR 24477	/ 06	29 November 2006
SP 6034 / 3	NMR 24477	/ 07	29 November 2006
SP 6034 / 7	NMR 24487	/ 11	29 November 2006
SP 6134 / 8	NMR 24487	/ 02	29 November 2006
SP 6134 / 9	NMR 24487	/ 03	29 November 2006
SP 6233 / 5	NMR 23608	/ 09	29 July 2004
SP 6233 / 6	NMR 23608	/ 10	29 July 2004
SP 6233 / 7	NMR 23608	/ 11	29 July 2004
SP 6233 / 8	NMR 23673	/ 05	29 July 2004
SP 6233 / 9	NMR 23673	/ 06	29 July 2004
SP 6234 / 19	NMR 24477	/ 10	29 November 2006
SP 6234 / 20	NMR 24477	/ 11	29 November 2006
SP 6234 / 21	NMR 24477	/ 12	29 November 2006
SP 6234 / 22	NMR 24477	/ 13	29 November 2006
SP 6234 / 23	NMR 24487	/ 27	29 November 2006
SP 6234 / 24	NMR 24487	/ 28	29 November 2006
SP 6234 / 25	NMR 24487	/ 29	29 November 2006
SP 6234 / 26	NMR 24487	/ 30	29 November 2006
SP 6330 / 1	NMR 26952	/ 39	04 May 2011
SP 6331 / 10	NMR 23660	/ 30	29 July 2004
SP 6331 / 11	NMR 23678	/ 08	29 July 2004
SP 6331 / 12	NMR 23678	/ 09	29 July 2004
SP 6331 / 13	NMR 23678	/ 10	29 July 2004
SP 6331 / 7	NMR 23660	/ 27	29 July 2004
SP 6331 / 8	NMR 23660	/ 28	29 July 2004
SP 6331 / 9	NMR 23660	/ 29	29 July 2004

Table 6: Cambridge University Collection of Aerial Photography aerial photographs consulted for the remote sensing survey of the Newton Purcell to Brackley study area

Cambridge University Collection of Aerial Photography catalogue number	Date taken	Type
ZknSA288	03 November 2006	Vertical

ZknSA289	03 November 2006	Vertical
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3.2 Figures

CH-004-14.01	Remote sensing survey interpretation	1:5,000
CH-004-14.02	Remote sensing survey interpretation	1:5,000
CH-004-14.03	Remote sensing survey interpretation	1:5,000
CH-004-14.04	Remote sensing survey interpretation	1:5,000
CH-004-14.05	Remote sensing survey interpretation	1:5,000
CH-004-14.06	Remote sensing survey interpretation	1:5,000
CH-004-14.07	Remote sensing survey interpretation	1:5,000
CH-004-14.08	Remote sensing survey interpretation	1:5,000
CH-004-14.09	Remote sensing survey interpretation	1:5,000
CH-004-14.10	Remote sensing survey interpretation	1:5,000

4 Geophysical surveys

4.1 Site GOoAE: Land near Westbury

Introduction

4.1.1 An archaeological geophysical survey was undertaken on a site near Westbury, Buckinghamshire (site code GOoAE). The aim of the survey was to locate and characterise any anomalies of possible archaeological interest within the survey site.

The site

4.1.2 The survey site was located some 700m west of Westbury (National Grid reference SP 6120 3570; Figure CH-004-14.11). It was originally defined as a roughly rectangular block of land, approximately 28.6ha in extent, encompassing two fields to the north of the Great Ouse and one field to the south of the river (Figure CH-004-14.12). Large parts of this area proved to be unsurveyable: the land to the south of the river was covered by a plantation and much of the land to the north was under a well-developed crop. The total area which could be surveyed amounted to approximately 6.9ha (Figure CH-004-14.13).

4.1.3 The Great Ouse flows eastwards across the southern part of the survey site at an elevation of approximately 95m above Ordnance Datum (AOD). To the north and south of the river's floodplain the ground rises up to a maximum elevation of approximately 110m AOD. A belt of alluvium is present alongside the river and geological strata of the Great Oolite group outcrop on the valley sides²¹.

Summary archaeological/historic background

4.1.4 The site lies to the west of Westbury village, where a settlement has been in existence since the 11th century²². Possible medieval house platforms²³ occur to the north-east of the 12th-century parish church of St Augustine²⁴, and 13th century documentary sources refer to a deer park in the village²⁵. A 17th century watermill lies on the outskirts of the modern village, to the east of the survey site²⁶. Earlier activity is indicated by the discovery of late 3rd century AD Roman metalwork in the garden of the village post office²⁷.

Methodology

- 4.1.5 The survey was carried out in accordance with current English Heritage guidelines²⁸ and a written scheme of investigation²⁹. A detailed magnetometer survey of the site was undertaken on 22 and 23 July 2013.
- 4.1.6 An independent network of 30m grid squares was established within each of the fields to be surveyed (Figure CH-004-14.13). Each grid was laid out with a tape measure and optical square and was tied in to the OS National Grid by recording the baseline location with a Leica Systems 1200 differential Global Positioning System .
- 4.1.7 The survey data was collected with Bartington Grad 601-2 twin sensor array vertical component fluxgate gradiometers. These are standard instruments for archaeological survey, capable of resolving magnetic field strength to a precision of 0.1 nanoTesla³⁰. The instruments were carried at a brisk but steady pace through each grid square, collecting data along 1m-spaced traverse lines. Measurements were automatically triggered every 0.25m along the traverses, giving a total of 3,600 measurements per square.
- 4.1.8 The survey data were viewed and processed using Geoplot 3.00v software. Striping, caused by slight mismatches in sensor balance, was removed using the 'Zero Mean Traverse' function and destaggering of the data was performed as necessary. Greyscale bitmaps of the data (scale +/- 4 nanoTesla, black/white) were exported and were georectified using the RasTools function in MapInfo v8. XY trace plots of the data were not produced as they were not considered to be appropriate in this instance.

Limitations

- 4.1.9 Magnetometer survey is a useful and widely-deployed form of archaeological prospection, but it suffers from several well-recognised limitations³¹:
- it is a shallow-seeking technique, generally unable to detect archaeology beneath more than 1m of overburden;
- small and ephemeral remains (e.g. postholes, beam slots, cremation burials, etc.) are rarely detected, especially at the standard survey resolution of 1m x 0.25m;
- stone building remains can only be detected under particularly favourable conditions;
- the technique can be ineffective over certain geological substrates which do not support the formation of well-developed contrasts in soil magnetism. It may also be hindered by highly magnetic geologies (e.g. ironstone, igneous dykes); and
- certain modern structures (e.g. fences, steel-framed buildings, water pipes) produce intense magnetic halos which can obscure the much weaker anomalies arising from archaeological remains.

²¹ British Geological Survey, GeoIndex, <http://mapapps2.bgs.ac.uk/geoindex/home.html>

²² Buckinghamshire Historic Environment Record No. 0706800000

²³ Buckinghamshire Historic Environment Record No. 0259800000

²⁴ Buckinghamshire Historic Environment Record No. 0076100000

²⁵ Buckinghamshire Historic Environment Record No. 0491202000

²⁶ Buckinghamshire Historic Environment Record No. 0283500000

²⁷ Buckinghamshire Historic Environment Record No. 0591100000

²⁸ English Heritage, (2008), *Geophysical Survey in Archaeological Field Evaluation*

²⁹ Cotswold Archaeology, (2013a), *HS2 Buckinghamshire: Written Scheme of Investigation for Geophysical and Metal Detecting Surveys*

³⁰ Bartington, G. and Chapman, C., (2003), 'A high-stability fluxgate magnetic gradiometer for shallow geophysical survey applications,' *Archaeological Prospection*, Vol. 11, Pgs. 19-34

³¹ English Heritage, (2008), Pgs. 13-18

	Assumptions	
4.1.10	There are no methodological assumptions applicable to the conduct of this survey. Readers should be aware, however, that the interpretation of archaeological geophysical data is a qualitative process, based on a combination of theoretical principles and past experience, and that absolute confidence is not always achievable.	
	Results: description	
4.1.11	See Figure CH-004-14.14. The data from Field 1 contains a series of parallel, magnetically positive linear anomalies. These are aligned approximately north/south and have slightly sinuous forms. There is also an elongated zone of irregular positive anomalies in the eastern part of the field, as well as two elongated positive anomalies in the north-western part. A few small dipolar anomalies are distributed randomly across the field.	
4.1.12	The data from Field 2 is variable in character. The north-eastern half is very subdued, but the south-western half is dominated by a complex arrangement of positive anomalies and negative halos. There is also a broad band of very low intensity magnetic 'noise' which crosses the south-western half of the data from south-west to north-east. A few dipolar anomalies are distributed randomly through the field. There are two magnetic halos: one located at the southern end of the field and the other against its eastern boundary.	
	Results: interpretation	
4.1.13	See Figure CH-004-14.15. The parallel linear anomalies in Field 1 are diagnostic of ridge and furrow. The dipolar anomalies indicate pieces of ferrous debris within the ploughsoil. The significance of the other Field 1 anomalies is less clear. It is most likely that they represent variations within the underlying geology, although there is a slight possibility that the two elongated anomalies could represent trenches or short lengths of ditch.	
4.1.14	The zone of positive anomalies and negative halos in the southern half of Field 2 is likely to indicate the extent of alluvial deposits alongside the river. The band of weak magnetic noise which runs on a north-east/south-western alignment across this zone is most likely to represent a spread of hardcore, perhaps laid to form a track across the floodplain. The magnetic halo at the southern end of Field 2 was caused by the adjacent footbridge. The halo against the eastern field boundary was probably caused by some modern structure or object.	
	Conclusions	
4.1.15	The survey has identified an area of ridge and furrow in the northern part of the survey site. Part of a possible undated trackway across the floodplain of the Great Ouse was also recorded.	
4.1.16	Other anomalies probably represent variations within the underlying geology, although there is a slight possibility that two elongated anomalies in the north-western corner of the site could represent trenches or short lengths of ditch.	
4.2	Site GOoAF: Illet's Farm	
	Introduction	
4.2.1	An archaeological geophysical survey was undertaken over a predefined area at Illet's Farm, Northamptonshire (National Grid reference: SP 5940 3880; Figure CH-004-14.16). The aim of the survey was to locate and characterise any anomalies of possible archaeological interest within the survey site.	
	The site	
4.2.2	The survey site lies to the west of the A43, approximately 1km north-east from the centre of Brackley. It is in the parish of Whitfield and South Northamptonshire District. At the time of the survey the site comprised three fields under recently-mown silage (Areas 1-3, Figure CH-004-14.17).	
4.2.3	The site is situated on bedrock of the Bilsworth Limestone formation. No superficial deposits are recorded ³² . The soils in the area are classified as well-drained calcareous fine loamy deposits of the Aberford (511a) association ³³ .	
	Summary archaeological/historic background	
4.2.4	The following section is summarised from the records of the Northamptonshire County HER.	
4.2.5	The site lies on a south-facing valley side, over well-drained calcareous soils overlooking the Great Ouse. The area has well-established archaeological potential, with archaeological investigations on the A43 and in northern Brackley recording settlement evidence of prehistoric to Roman date.	
	Methodology	
4.2.6	All survey work was carried out in accordance with current English Heritage guidelines ³⁴ and a written scheme of investigation ³⁵ .	
4.2.7	All survey grid positioning was carried out using Trimble R8 Real Time Kinematic (RTK) VRSNow equipment. The geophysical survey area was georeferenced relative to the OS National Grid by tying in to local detail. These tie-ins are presented in Figure CH-004-14.26. Please refer to this diagram when re-establishing the grid.	
4.2.8	The magnetometer survey was carried out with Bartington Grad 601-2 fluxgate gradiometers, collecting data every 0.25m along traverses 1m apart. Data processing has been performed as appropriate using an in-house software package (GeoSub), employing the following processing steps: zero mean sensor, step correction (de-stagger) and interpolation (on the Y axis).	

³² British Geological Survey; *Geology of Britain Viewer*; <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>; Accessed: 26/07/2013³³ Soil Survey of England and Wales, (1983), *Soils of England and Wales, Sheet 3: Midland and Western England*, Harpenden³⁴ English Heritage, (2008)³⁵ Cotswold Archaeology, (2013b), *HS2 Northamptonshire: Written Scheme of Investigation for Geophysical and Metal Detecting Surveys*

4.2.9 Data are presented as greyscale and XY trace plots (Figures CH-004-14.18, CH-004-14.20, CH-004-14.21, CH-004-14.22, CH-004-14.23, CH-004-14.24, CH-004-14.25). The former enables simple feature identification and basic interpretation, whilst the latter allows for analysis of the shape of the individual anomalies in order to better characterise the recorded responses.

Limitations

- 4.2.10 Magnetic survey is an exceedingly effective technique for site evaluation. It provides fast data acquisition and responds, to some degree, to the majority of archaeological site-types. The technique relies upon anthropogenic enhancement of naturally-occurring iron-bearing compounds in the soil. Detection rates can be poor where archaeological sites have only seen temporary and/or sporadic occupation, or where there is insufficient activity to drive the enhancement. This is often true of lithic-era sites.
- 4.2.11 Success may also be limited over soils that are deficient in iron compounds, providing little material to be subject to enhancement. Conversely the strength of response from soils and geological units which are naturally magnetic, for example igneous formations and soils derived thereof, may mask any subtler archaeological enhancement within.
- 4.2.12 The presence of ferrous structures either above or below ground (buildings, pylons, fences, pipes, etc.) will produce very strong magnetic fields which will extend far beyond their physical footprints. The strength of these magnetic 'shadows' is such that they can mask practically any archaeological anomalies. Similarly, later features and demolition spreads or imported consolidation material can produce areas of magnetic disturbance that can mask underlying features.
- 4.2.13 As a general rule, the Bartington Grad601 instruments allow for a depth of investigation of approximately 1m, depending on the strength of the field produced by the buried feature. Below this depth only particularly enhanced material will be detected with any degree of confidence.
- 4.2.14 The site survey conditions were good. The site was under recently-mown silage which did not impede the survey. Area 1 sloped down from north to south, and Areas 2 and 3 sloped downwards from west to east. An electricity pylon in Area 1 has caused a small gap in the data.

Assumptions

- 4.2.15 All of the fields contain small-scale ferrous anomalies, most clearly represented by sharp 'spikes' in the XY trace plots. These are typically assumed to be modern debris within the topsoil unless the site type or prior knowledge suggests otherwise.

Results: description

- 4.2.16 See Figure CH-004-14.18. The eastern part of Area 1 is dominated by strong linear and discrete magnetic responses which extend into the southern part of Area 2. Numerous relatively weak parallel linear anomalies are also evident in Areas 1 and 2. Mottled weak magnetic anomalies are visible in the southern part of Area 1 and the northern part of Area 3.

A very strong alternately positive and negative linear anomaly has been identified towards the eastern edge of Area 2.

Results: interpretation

Archaeology/possible archaeology

- 4.2.17 See Figure CH-004-14.19. A large group of anomalies has been identified in the north-eastern part of Area 1 and the southern part of Area 2. This complex is apparently defined by ditch [1] and contains two large rectilinear enclosures, as well as several smaller enclosures, subdivisions and pits. While the majority of these anomalies are clearly archaeological in nature, the shorter linear and pit-like responses within the enclosure complex have been placed in the 'Possible Archaeology' category, reflecting the lesser degree of confidence in their interpretation.
- 4.2.18 A rectilinear group of anomalies [2] measuring approximately 20m² lies at the eastern limit of Area 1, to the immediate east of the main enclosure complex. These anomalies have a stronger magnetic signature than the surrounding responses.
- 4.2.19 A possible ditch [3] has been recorded in the north-western corner of Area 1. A continuation of this feature may be visible in the western part of Area 3 as weak trends [4].

Natural/uncertain origin

- 4.2.20 Anomalies reflecting changes within the pedological nature of the soil have been identified. These anomalies display a characteristic mottled effect within the greyscales. In Area 1 a group of similar anomalies [5] has been categorised as being of uncertain origin, as their proximity to possible archaeological deposits casts some doubt upon their provenance.
- 4.2.21 Several pit-like responses and weak trends in Areas 2 and 3 are likely to be due to natural or agricultural effects, but an archaeological origin cannot be dismissed entirely.

Agriculture

- 4.2.22 Parallel linear responses in all three areas are due to former ridge and furrow cultivation and more recent ploughing.

Modern

- 4.2.23 A strong magnetic response in the northern part of Area 1 is due to an electricity pylon. This magnetic 'halo' has masked a section of ditch.
- 4.2.24 A pipe has been detected in the eastern part of Areas 1 and 2. Zones of ferrous disturbance in the north-western part of Area 2 and along the eastern limit of Area 3 are due to a possible concrete footing and a track, respectively.

Conclusions		
4.2.25	The geophysical survey detected a complex of enclosures and related features in Areas 1 and 2.	CH-004-14.23 GOoAF: Magnetic Data - Area 2: Greyscale Plot 1:1000
4.2.26	A possible ditch was identified running along the western edge of the site.	CH-004-14.24 GOoAF: Magnetic Data - Area 3: XY Trace Plot 1:1000
4.2.27	Evidence for ridge and furrow cultivation was recorded.	CH-004-14.25 GOoAF: Magnetic Data - Area 3: Greyscale Plot 1:1000
4.2.28	Anomalies reflecting changes within the pedological nature of the soil have also been identified, although there is the possibility that some of these anomalies are archaeological in nature.	CH-004-14.26 GOoAF: Tie-In Diagram 1:1250

4.3 References

Bartington, G. and Chapman, C., (2003), 'A high-stability fluxgate magnetic gradiometer for shallow geophysical survey applications,' *Archaeological Prospection*, Vol. 11, Pgs. 19–34.

British Geological Survey; *GeoIndex*; <http://mapapps2.bgs.ac.uk/geoindex/home.html>; Accessed: July 2013.

British Geological Survey; *Geology of Britain Viewer*; <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>; Accessed: 26/07/2013.

Cotswold Archaeology, (2013a), *HS2 Buckinghamshire: Written Scheme of Investigation for Geophysical and Metal Detecting Surveys*.

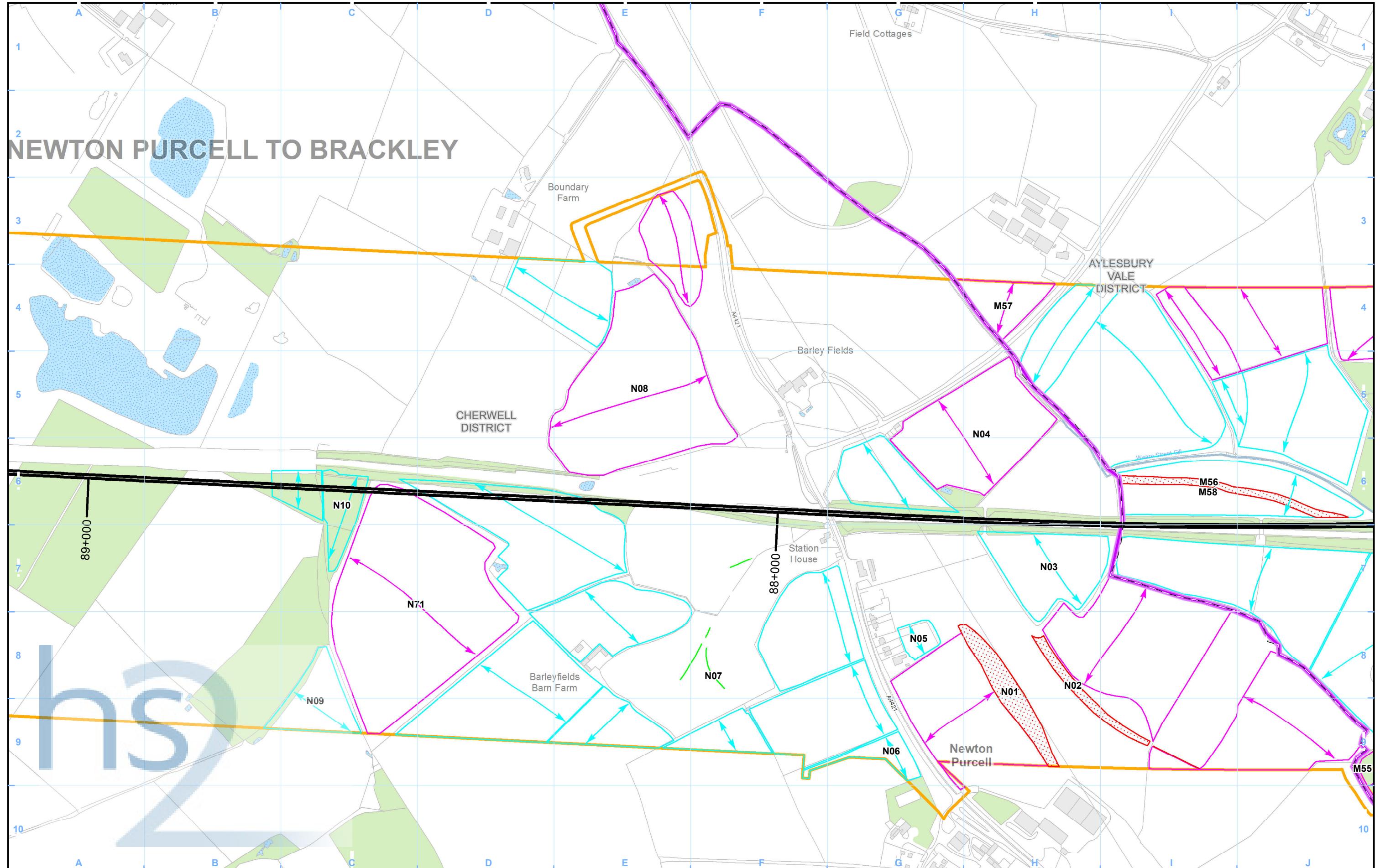
Cotswold Archaeology, (2013b), *HS2 Northamptonshire: Written Scheme of Investigation for Geophysical and Metal Detecting Surveys*.

English Heritage, (2008), *Geophysical Survey in Archaeological Field Evaluation*.

Soil Survey of England and Wales, (1983), *Soils of England and Wales, Sheet 3: Midland and Western England*, Harpenden.

4.4 Figures

CH-004-14.11	GOoAE: Site location diagram	1:50,000
CH-004-14.12	GOoAE: Location of survey area	1:15,000
CH-004-14.13	GOoAE: Tie-in information	1:2,500
CH-004-14.14	GOoAE:Magnetometer data plot	1:2,500
CH-004-14.15	GOoAE: Interpretation plot	1:2,500
CH-004-14.16	GOoAF: Site Location Diagram	1:50000
CH-004-14.17	GOoAF: Location of Survey Areas	1:5000
CH-004-14.18	GOoAF: Magnetometer Survey - Greyscale Plot	1:2500
CH-004-14.19	GOoAF: Magnetometer Survey - Interpretation	1:2500
CH-004-14.20	GOoAF: Magnetic Data - Area 1: XY Trace Plot	1:1000
CH-004-14.21	GOoAF: Magnetic Data - Area 1: Greyscale Plot	1:1000
CH-004-14.22	GOoAF: Magnetic Data - Area 2: XY Trace Plot	1:1000



Legend

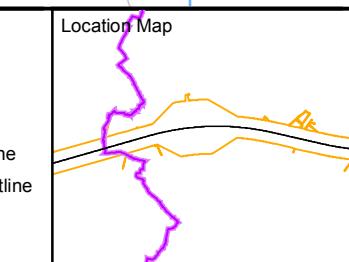
- Route in tunnel
- Route on surface
- Community forum boundary
- District/Borough boundary
- Watercourse
- Water body
- Woodland

Remote sensing survey boundary

- Archaeological features
- Bank
- Ditch
- Extant ridge and furrow direction
- Levelling ridge and furrow direction
- Structure
- T-Hachure

Archaeological features

- Extent of Area
- Bank
- Ditch
- Extant ridge and furrow outline
- Levelling ridge and furrow outline
- Structure
- Large cut feature



Map Number CH-004-14.01
Map Name Remote Sensing Survey Interpretation
Community Forum Area CFA14: Newton Purcell to Brackley

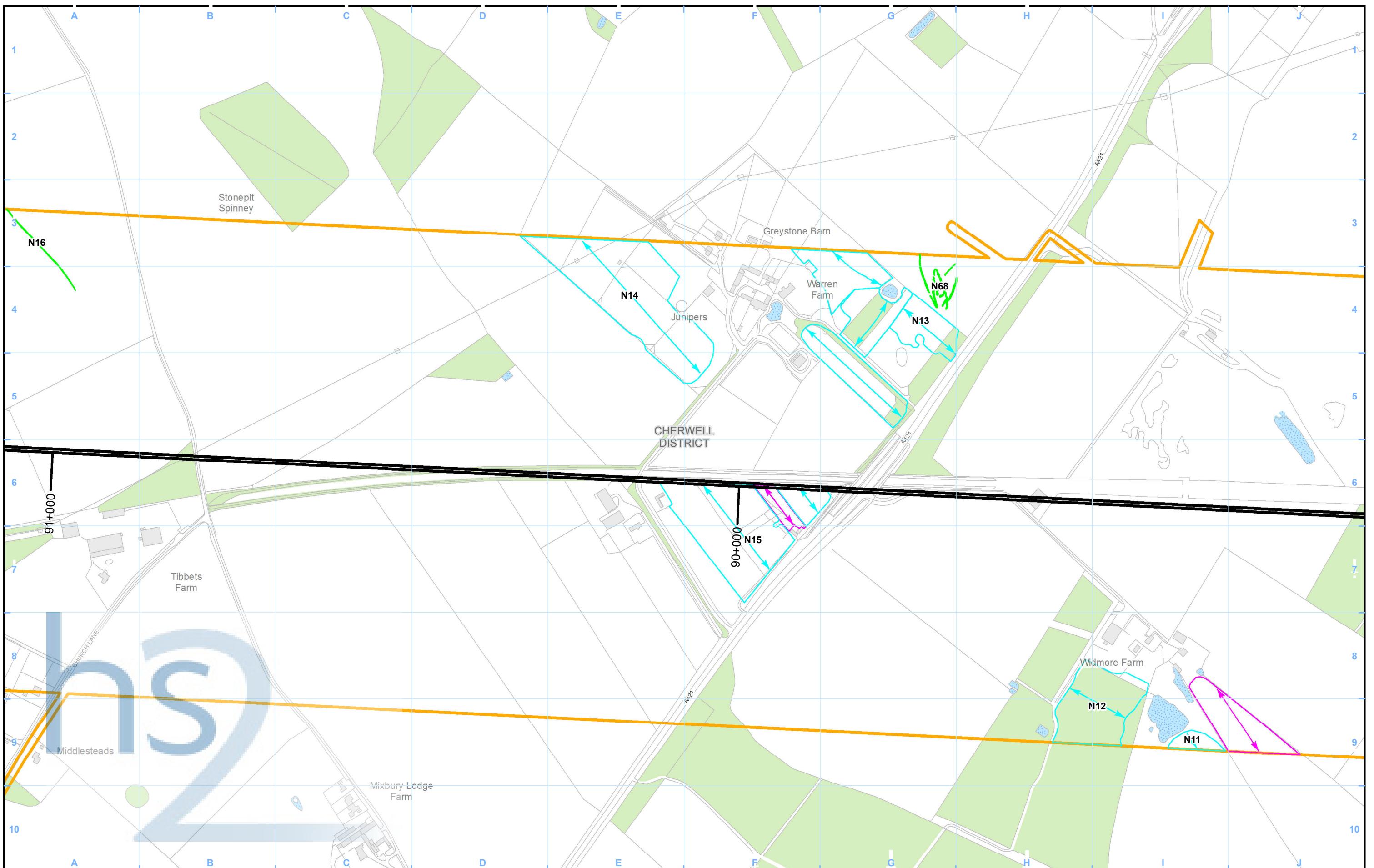
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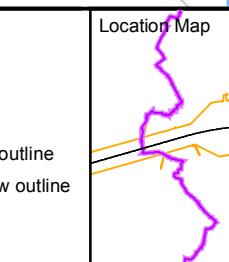
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Legend

- Route in tunnel
- Route on surface
- Community forum boundary
- District/Borough boundary
- Watercourse
- Water body
- Woodland
- Remote sensing survey boundary
- Extant ridge and furrow direction
- Levelled ridge and furrow direction
- Structure
- T-Hachure
- Archaeological features
- Bank
- Ditch
- Extant ridge and furrow outline
- Levelled ridge and furrow outline
- Structure
- Large cut feature
- Extent of Area
- Bank
- Ditch
- Extant ridge and furrow outline
- Levelled ridge and furrow outline
- Structure
- Large cut feature



Map Number: CH-004-14.02
Map Name: Remote Sensing Survey Interpretation
Community Forum Area CFA14: Newton Purcell to Brackley

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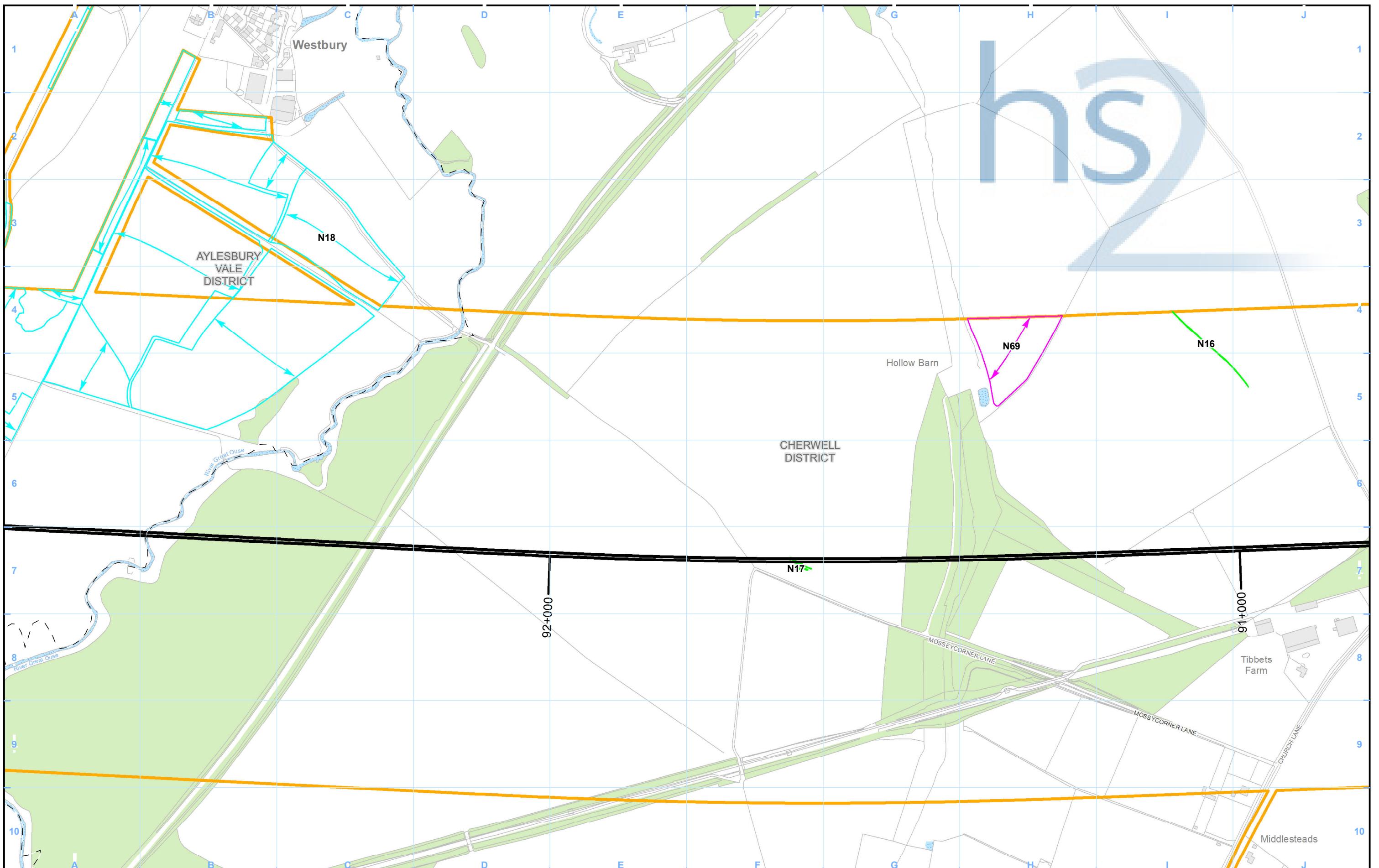
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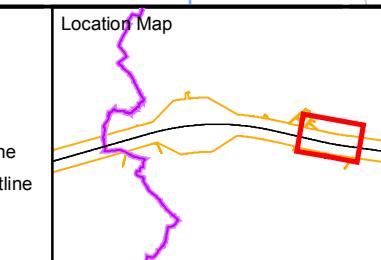


Legend

- Route in tunnel
- Route on surface
- Community forum boundary
- District/Borough boundary
- Watercourse
- Water body
- Woodland
- Remote sensing survey boundary
- Extant ridge and furrow direction
- Levelling ridge and furrow direction
- Structure
- T-Hachure
- Bank
- Ditch
- Extant ridge and furrow outline
- Levelling ridge and furrow outline
- Structure
- Large cut feature
- Extent of Area
- Bank
- Ditch
- Extant ridge and furrow outline
- Levelling ridge and furrow outline
- Structure
- Large cut feature

Archaeological features

- Bank
- Ditch
- Extant ridge and furrow direction
- Levelling ridge and furrow direction
- Structure
- Large cut feature



Map Number: CH-004-14.03
Map Name: Remote Sensing Survey Interpretation
Community Forum Area CFA14: Newton Purcell to Brackley

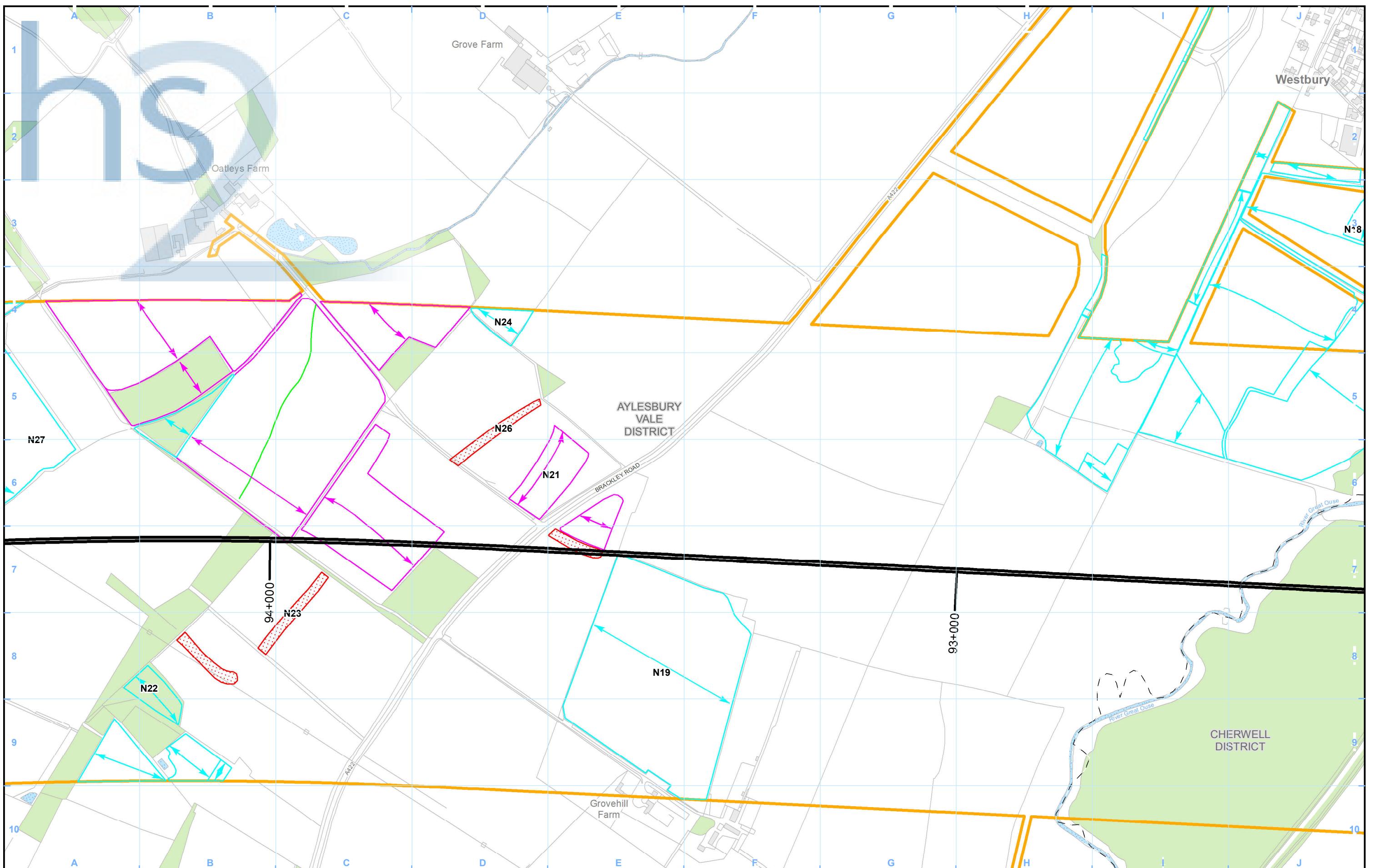


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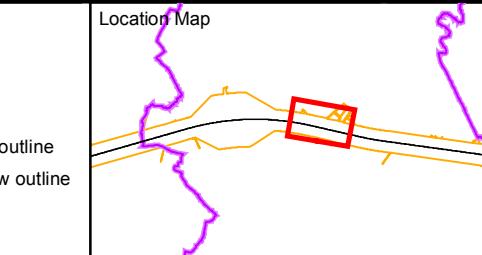
0 50 100 150 200 Metres

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Doc Number: C252-ETM-EV-MAP-020-002602-P03.00
Date: 06/09/13



Legend

- Route in tunnel
- Route on surface
- Community forum boundary
- District/Borough boundary
- Watercourse
- Water body
- Woodland
- Remote sensing survey boundary
- Archaeological features
- Bank
- Ditch
- Extant ridge and furrow direction
- Levelled ridge and furrow direction
- Structure
- T-Hachure
- Extent of Area
- Bank
- Ditch
- Extant ridge and furrow outline
- Levelled ridge and furrow outline
- Structure
- Large cut feature



Map Number: CH-004-14.04
Map Name: Remote Sensing Survey Interpretation
Community Forum Area CFA14: Newton Purcell to Brackley

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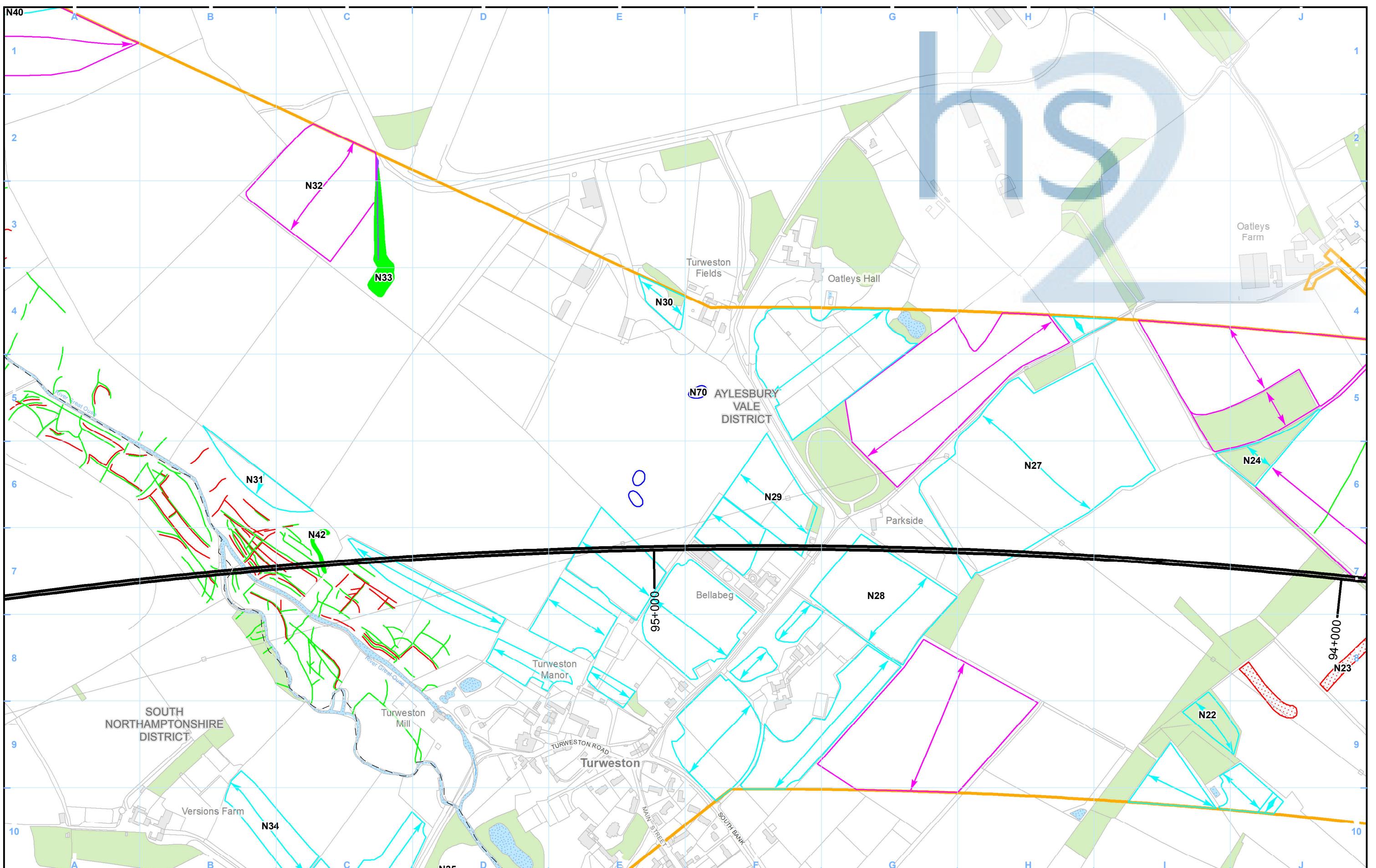
Scale at A3: 1:5,000

0 50 100 150 200 Metres

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Date: 06/09/13



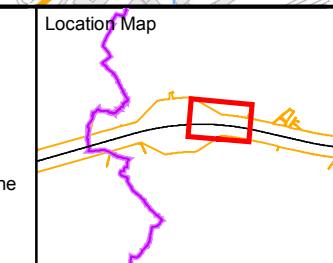
Legend

- Route in tunnel
- Route on surface
- Community forum boundary
- District/Borough boundary
- Watercourse
- Water body
- Woodland
- Remote sensing survey boundary
- Archaeological features
- Bank
- Ditch
- Extant ridge and furrow direction
- Levelled ridge and furrow direction
- Structure
- T-Hachure
- Extant ridge and furrow outline
- Levelled ridge and furrow outline
- Structure
- Large cut feature

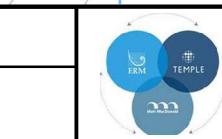
Extent of Area

Bank	Bank
Ditch	Ditch
Extant ridge and furrow direction	Extant ridge and furrow outline
Levelled ridge and furrow direction	Levelled ridge and furrow outline
Structure	Structure
T-Hachure	Large cut feature

Location Map



Map Number
CH-004-14.06
Map Name
Remote Sensing Survey Interpretation
Community Forum Area CFA14:
Newton Purcell to Brackley

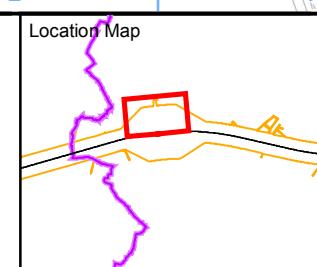
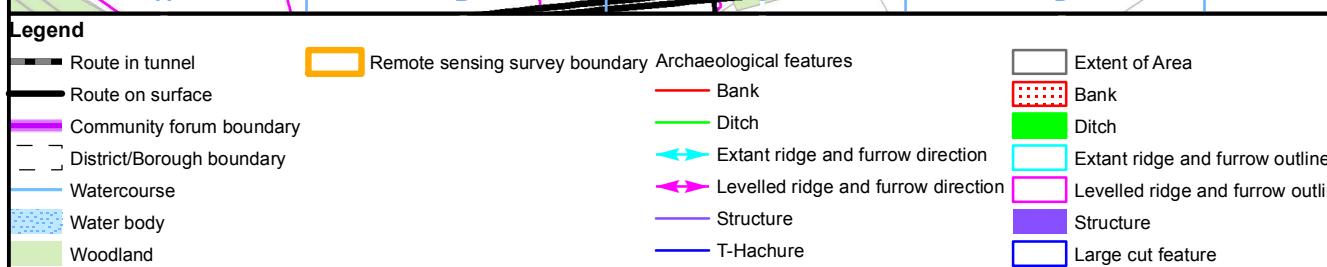
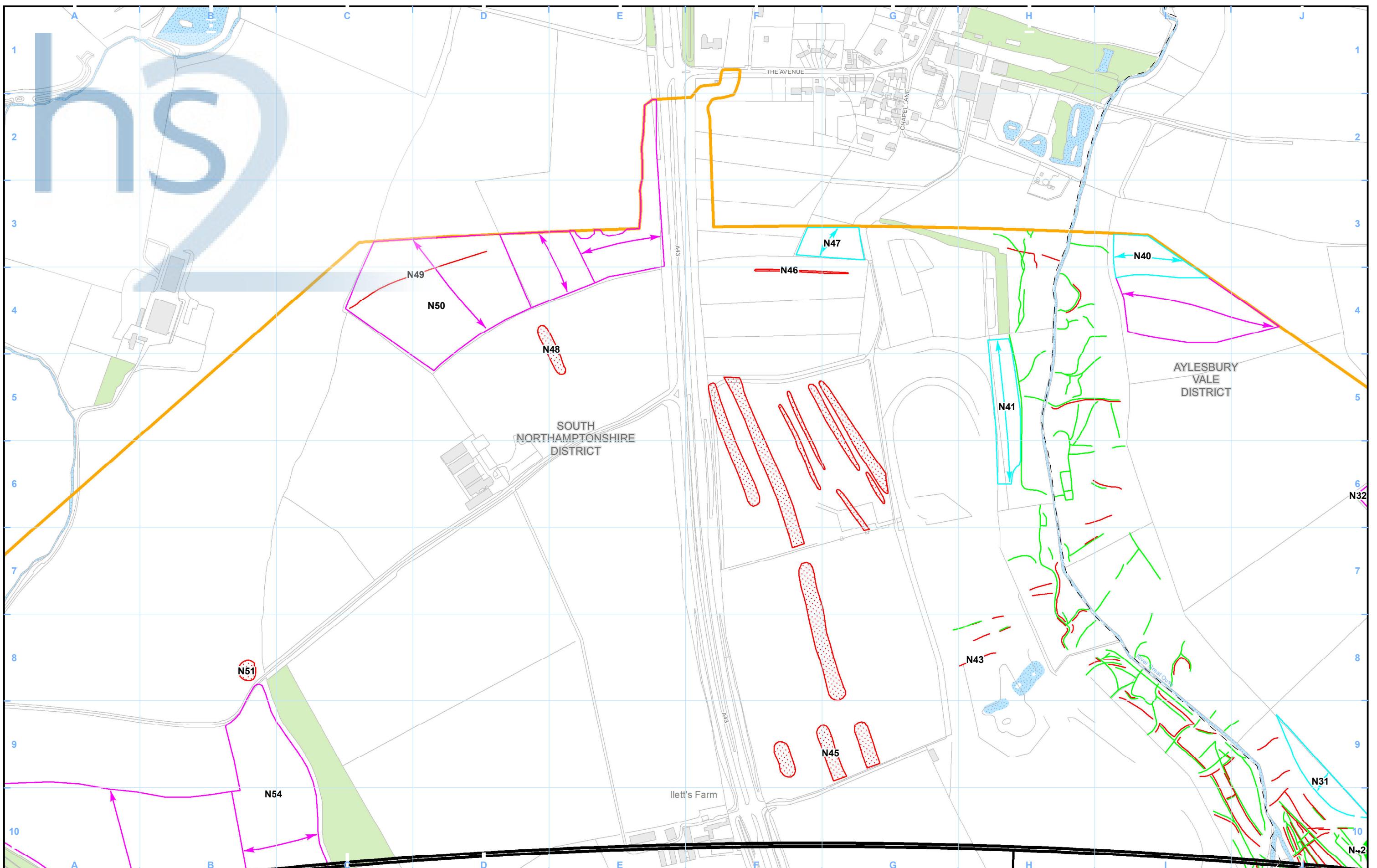


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Map Number
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Map Name
Remote Sensing Survey Interpretation
Community Forum Area CFA14:
Newton Purcell to Brackley

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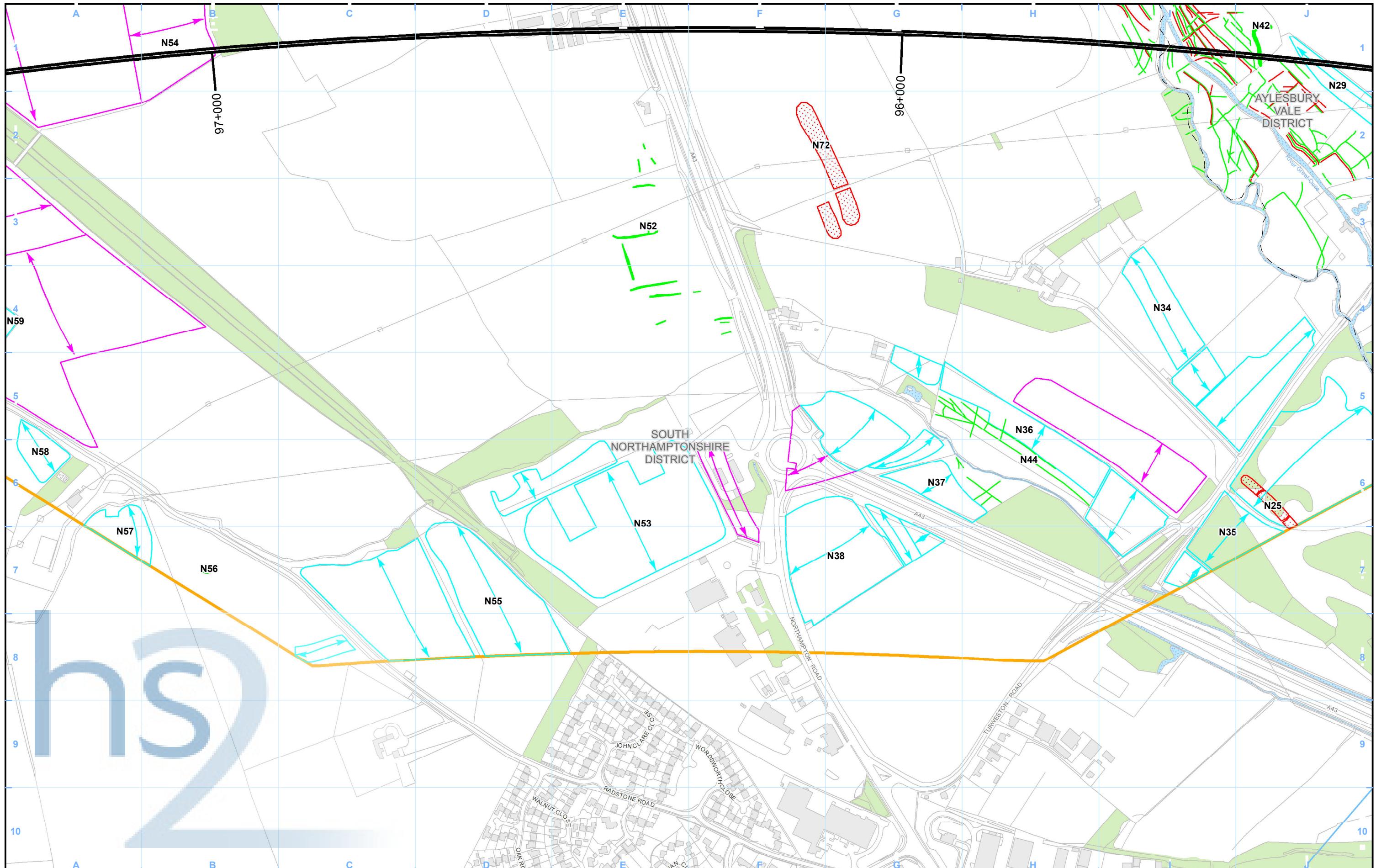
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Date: 06/09/13



Legend

- Route in tunnel
 - Route on surface
 - Community forum boundary
 - District/Borough boundary
 - Watercourse
 - Water body
 - Woodland

Remote sensing survey boundary Archaeological features

- | | |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------|
| Archaeological features |  Extent of Area |
| Bank |  Bank |
| Ditch |  Ditch |
| Extant ridge and furrow direction |  Extant ridge and furrow outline |
| Levelled ridge and furrow direction |  Levelled ridge and furrow outline |
| Structure |  Structure |
| T-Hachure |  Large cut feature |

Location Ma

CH-004-14.08

Name

Remote Sensing Survey Interpretation

Community Forum Area CFA14
Newton Purcell to Brackley



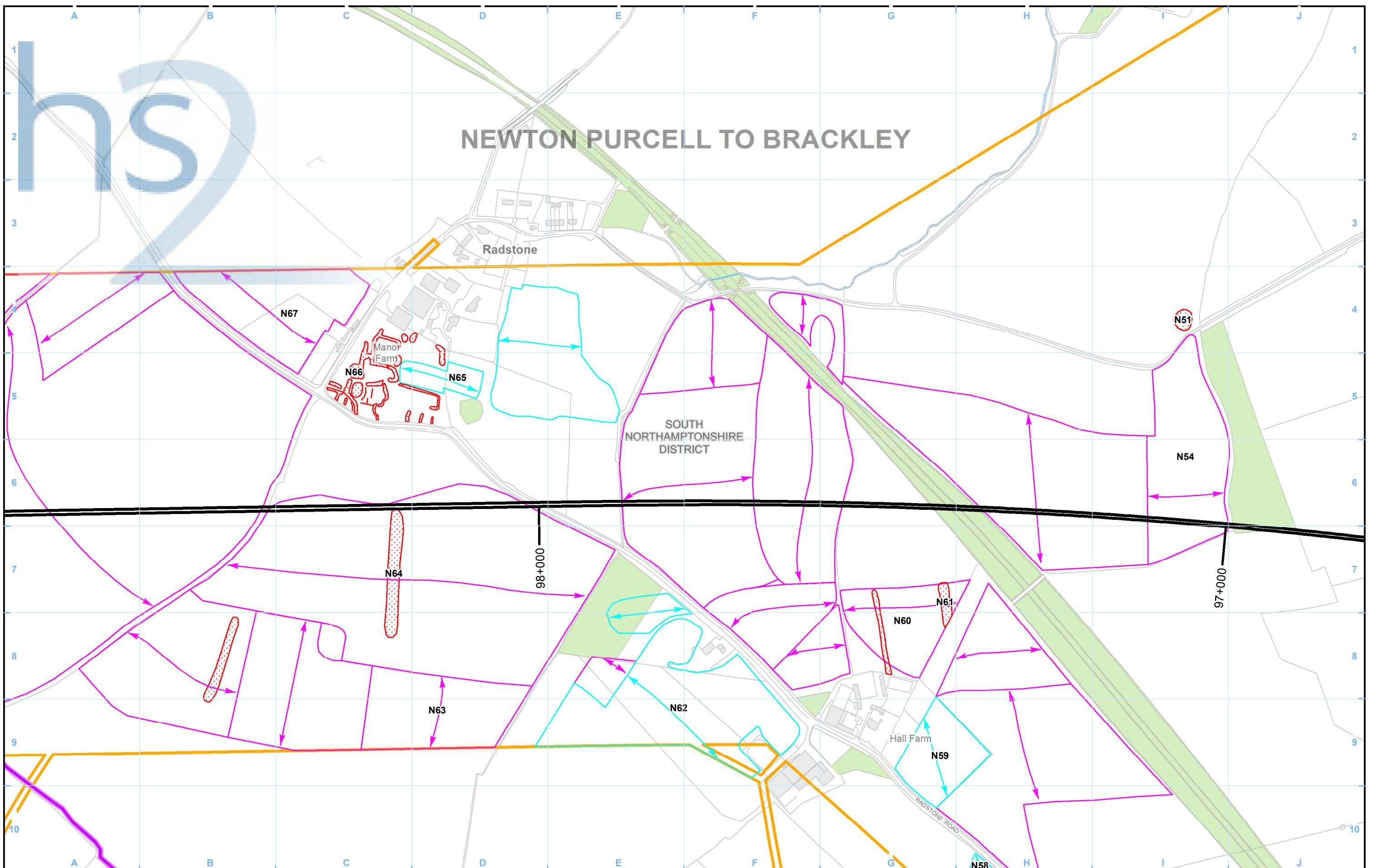
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Scale at A3: 1:5,000
Metres

Scale at A3: 1:5 000

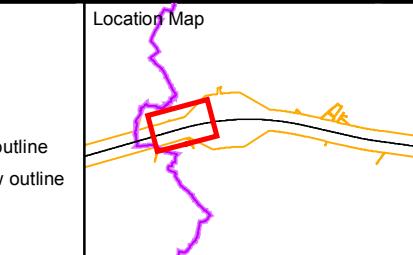


Date: 06/09/13



Legend

- Route in tunnel
- Route on surface
- Community forum boundary
- District/Borough boundary
- Watercourse
- Water body
- Woodland
- Remote sensing survey boundary
- Extant ridge and furrow direction
- Levelled ridge and furrow direction
- Structure
- T-Hachure
- Archaeological features
- Bank
- Ditch
- Extant ridge and furrow outline
- Levelled ridge and furrow outline
- Structure
- Large cut feature
- Extent of Area
- Bank
- Ditch
- Extant ridge and furrow outline
- Levelled ridge and furrow outline
- Structure
- Large cut feature



Map Number CH-004-14.09
Map Name Remote Sensing Survey Interpretation
Community Forum Area CFA14: Newton Purcell to Brackley

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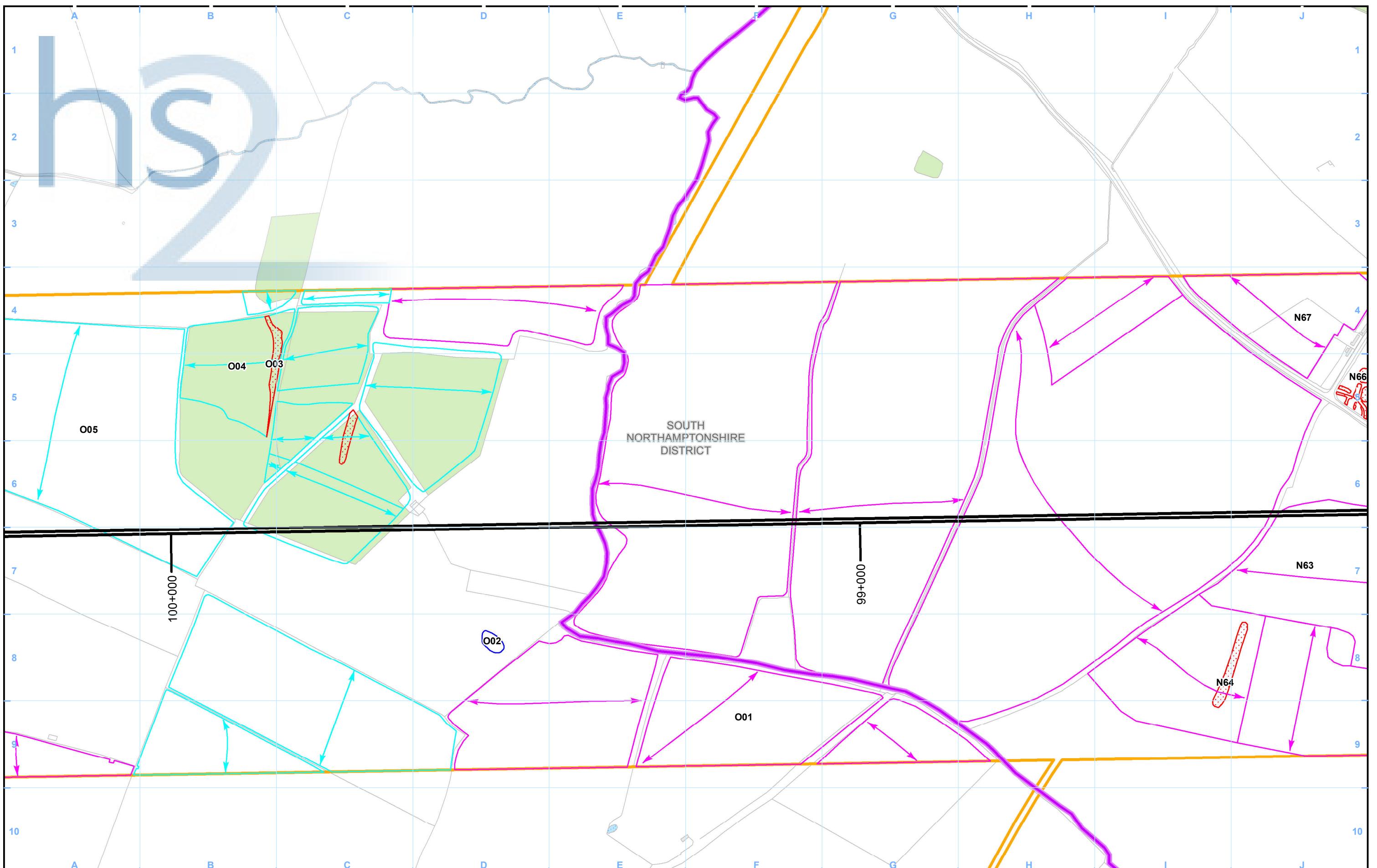
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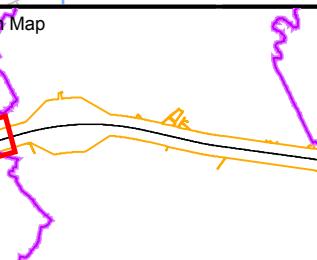
Date: 06/09/13



Legend

- Route in tunnel
- Route on surface
- Community forum boundary
- District/Borough boundary
- Watercourse
- Water body
- Woodland
- Remote sensing survey boundary
- Extant ridge and furrow direction
- Levelled ridge and furrow direction
- Structure
- T-Hachure
- Archaeological features
- Bank
- Ditch
- Extant ridge and furrow outline
- Levelled ridge and furrow outline
- Structure
- Large cut feature
- Extent of Area
- Bank
- Ditch
- Extant ridge and furrow outline
- Levelled ridge and furrow outline
- Structure
- Large cut feature

Location Map



Map Number

CH-004-14.10
Remote Sensing Survey Interpretation

Community Forum Area CFA14:
Newton Purcell to Brackley

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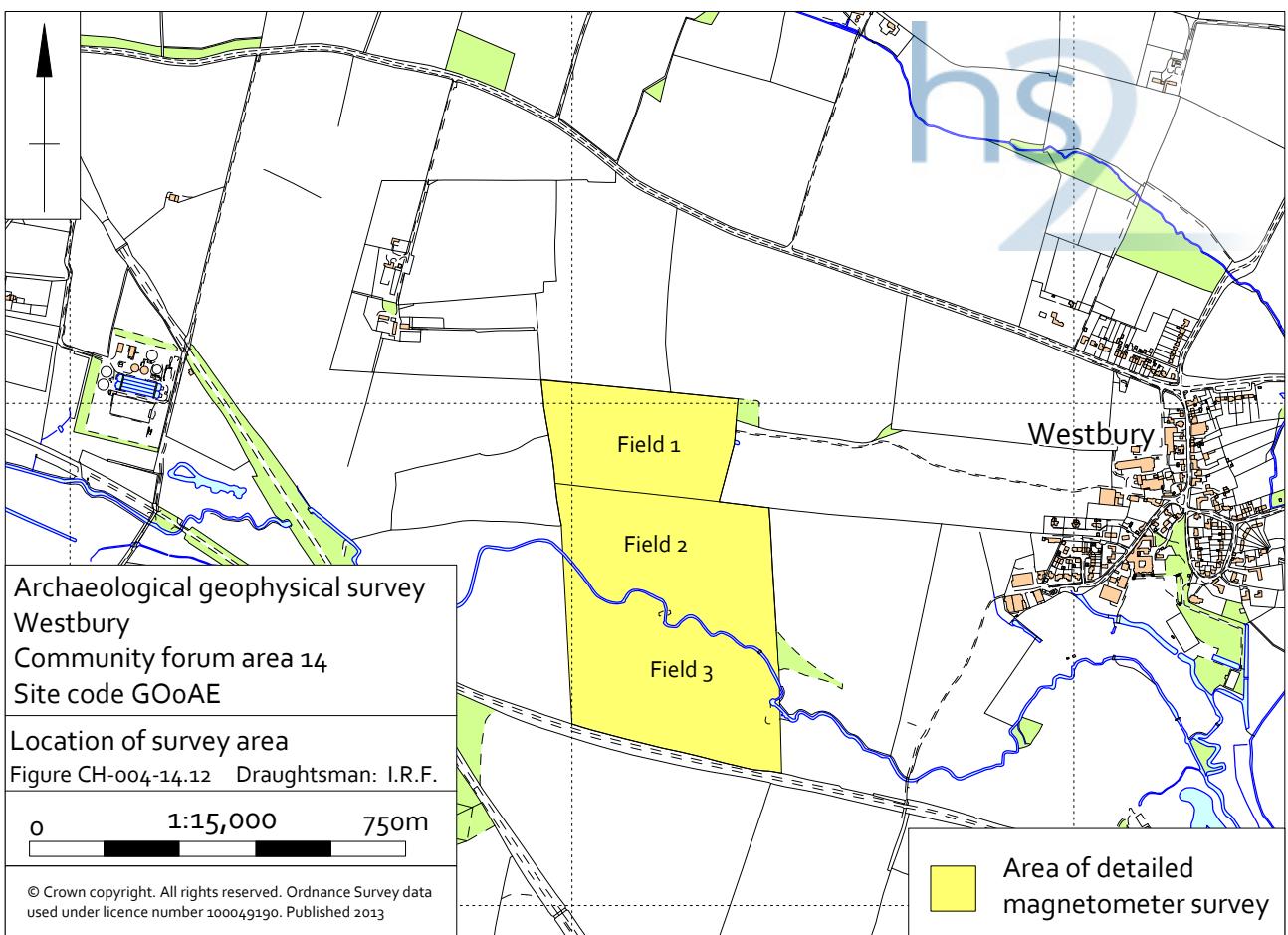
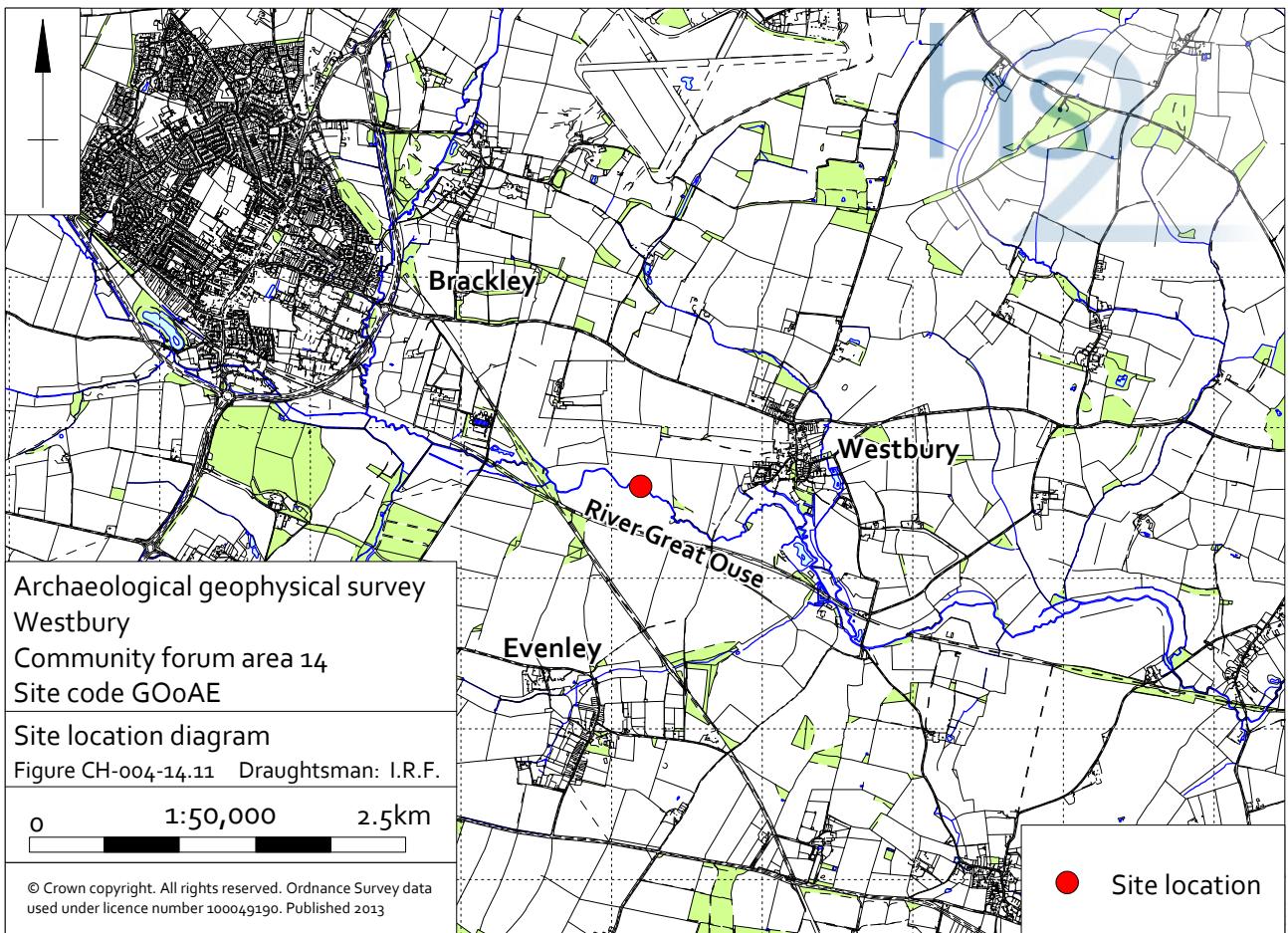
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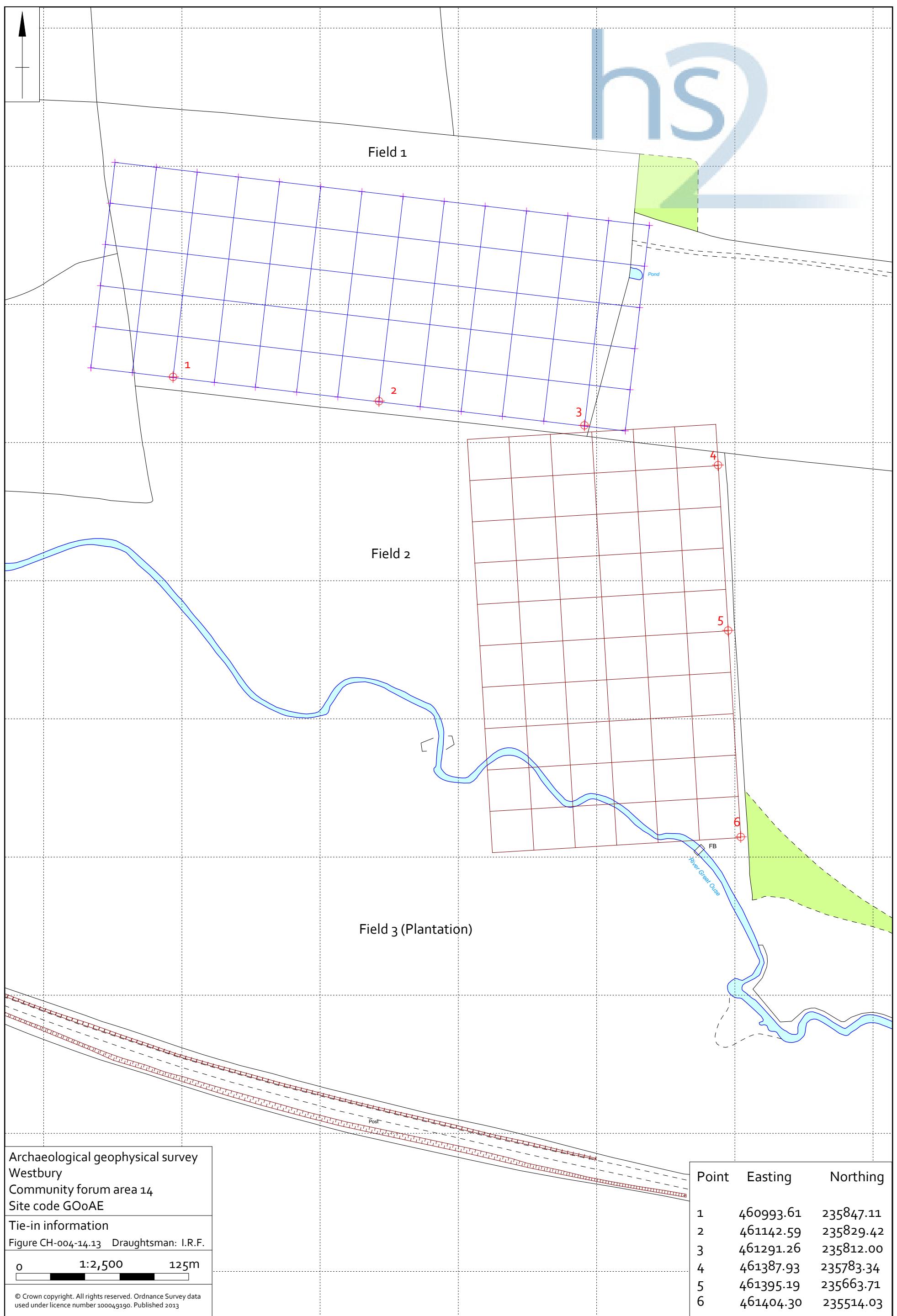


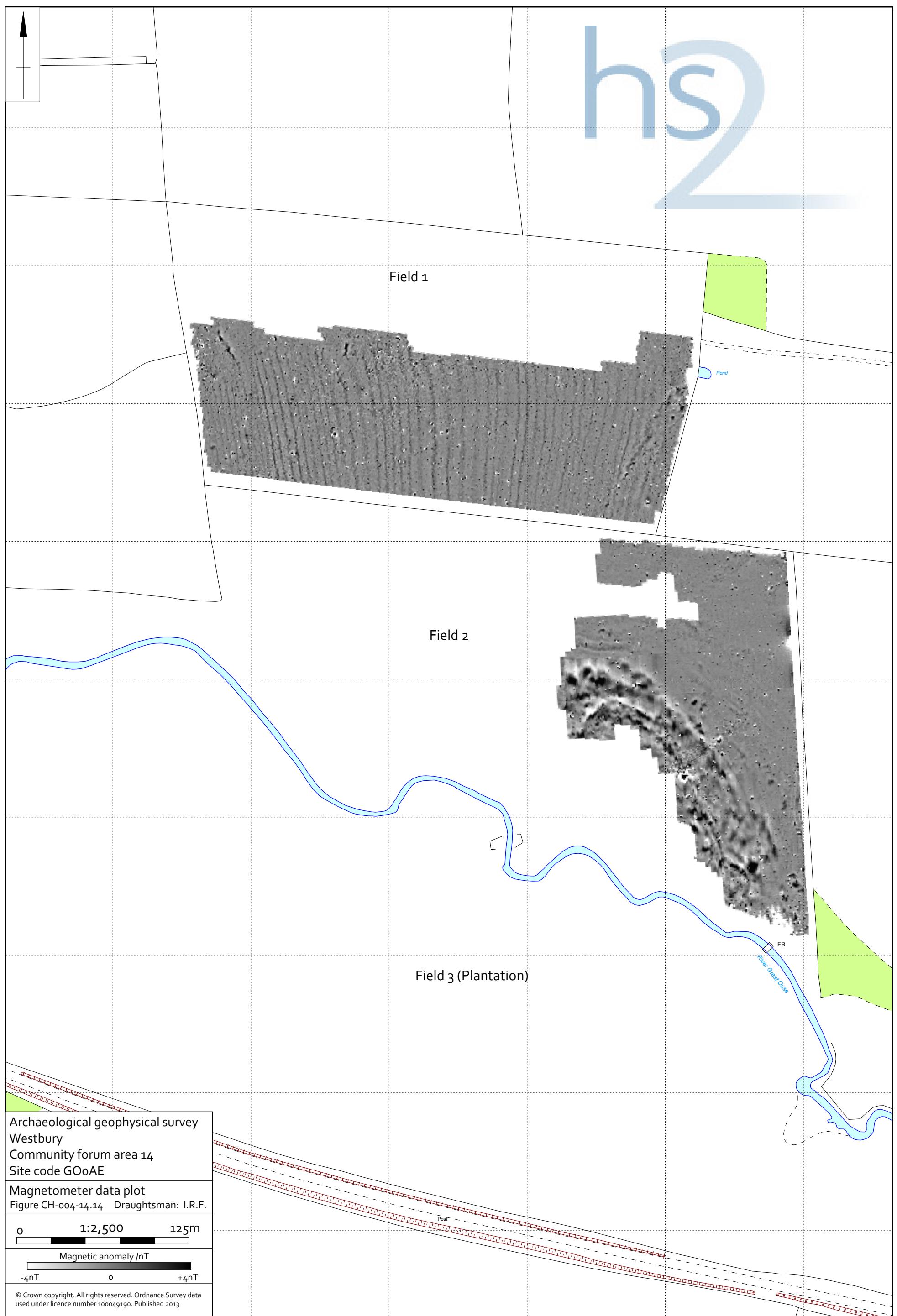
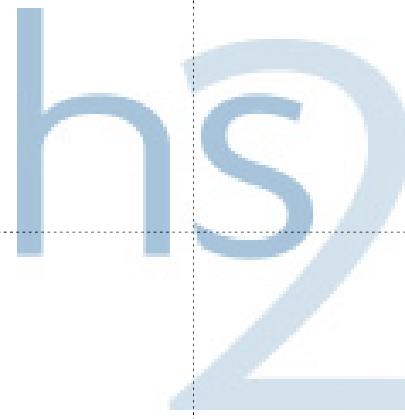
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0 50 100 150 200
Metres

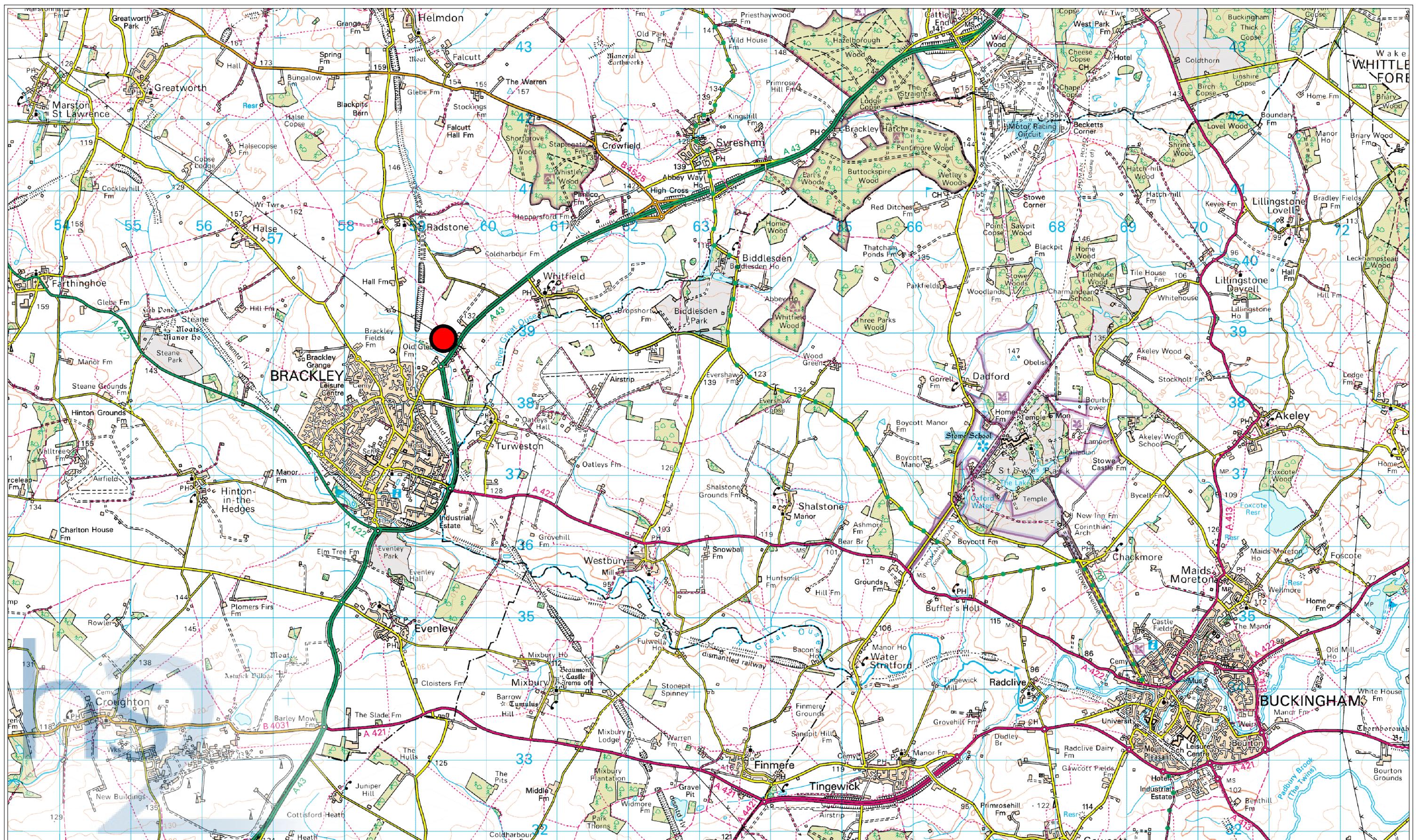
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Site Location

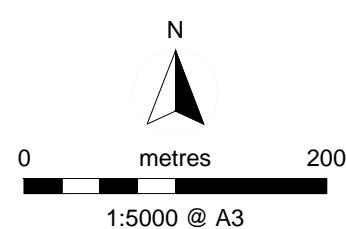
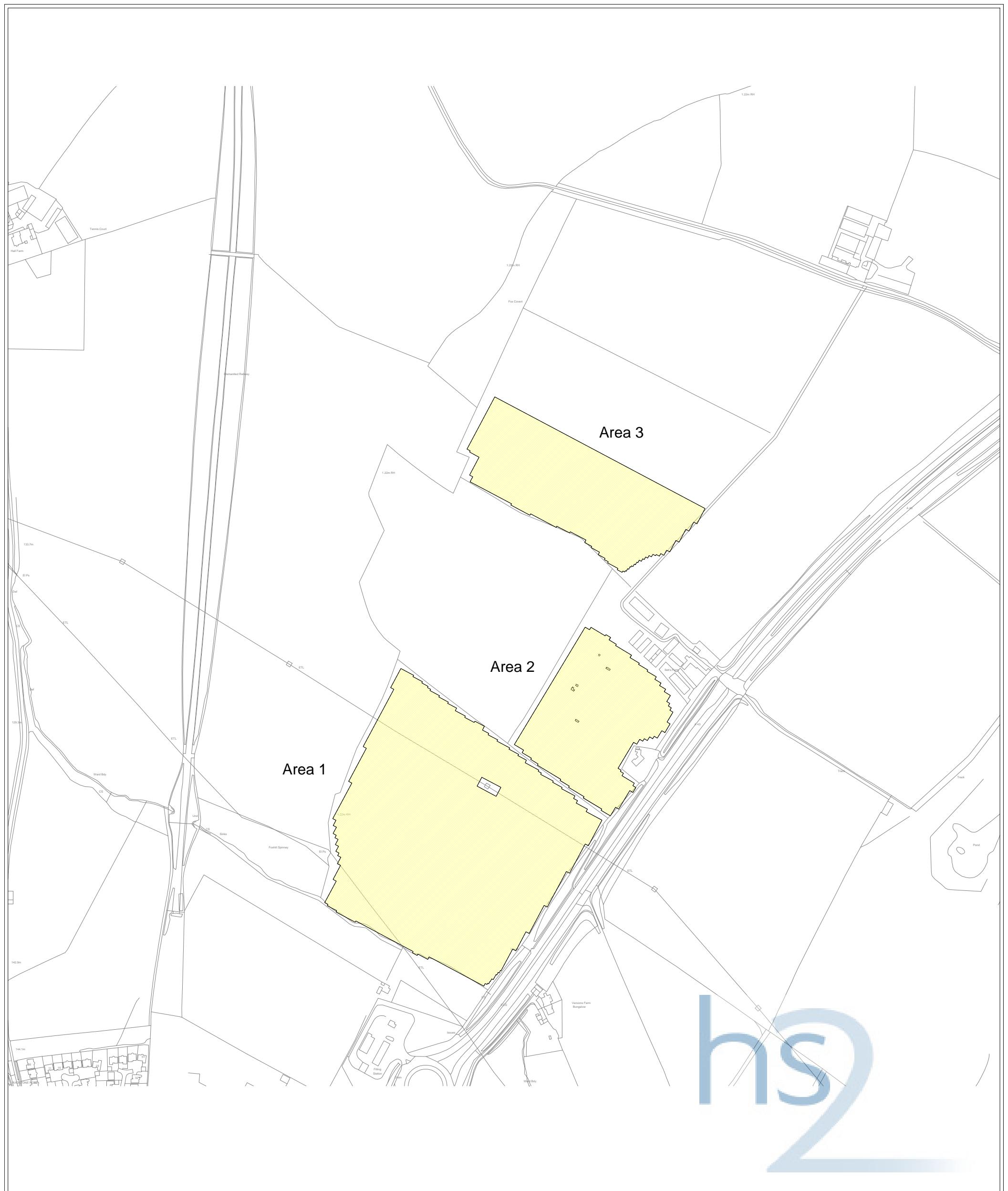
Project: G1317/5 HS2: C252 Country South
CFA14 GO0AF Illet's Farm

Title: GO0AF Site Location Diagram

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Gradiometer Survey

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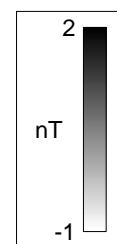
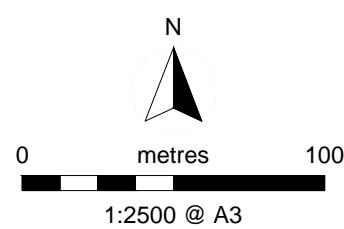
Title: GO0AF Location of Survey Areas

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Drawn by: ELWood

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CFA14 GO0AF Illet's Farm

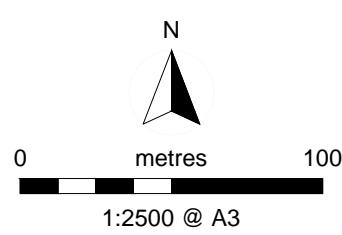
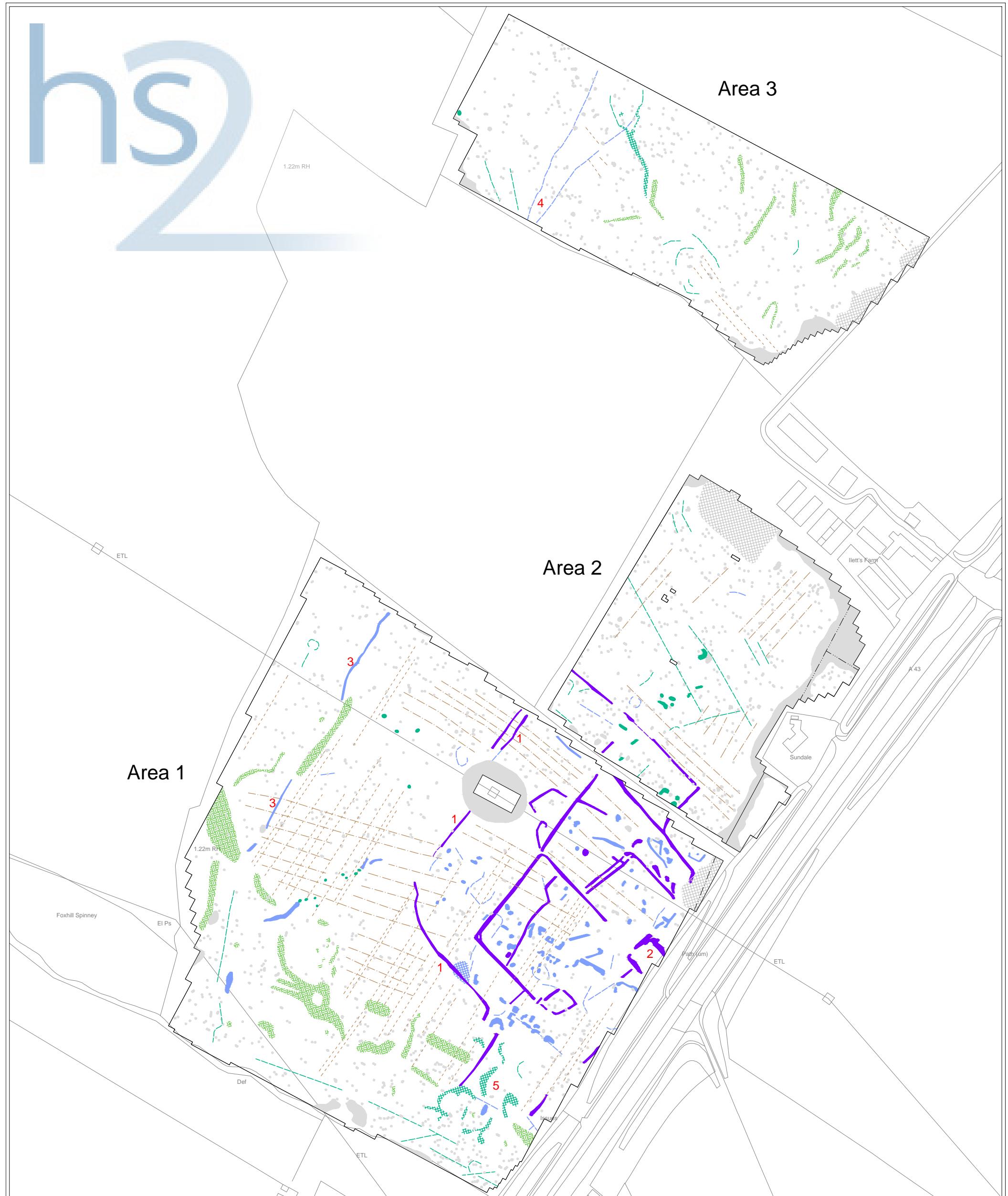
Title: GO0AF Magnetometer Survey
Greyscale Plot

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hs



- | | | | |
|---------------------------------------|---------------------------------------------------|----------------------------------------|-----------------------------------------------|
| [Purple hatched box] | Archaeology
(discrete / trend) | [Green hatched box] | Natural |
| [Blue hatched box with diagonal line] | Possible Archaeology
(discrete / zone / trend) | [Green hatched box with diagonal line] | Uncertain Origin
(discrete / zone / trend) |
| [Dashed brown box] | Agriculture - Ridge & Furrow | [Dashed orange box] | Pipe |
| [Dashed orange box] | Agriculture - Ploughing | [Grey hatched box] | Ferrous
(discrete / zone) |

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CFA14 GO0AF Illet's Farm

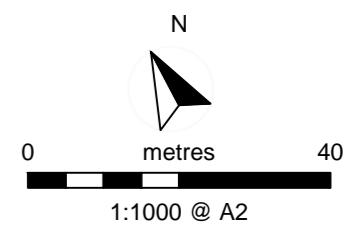
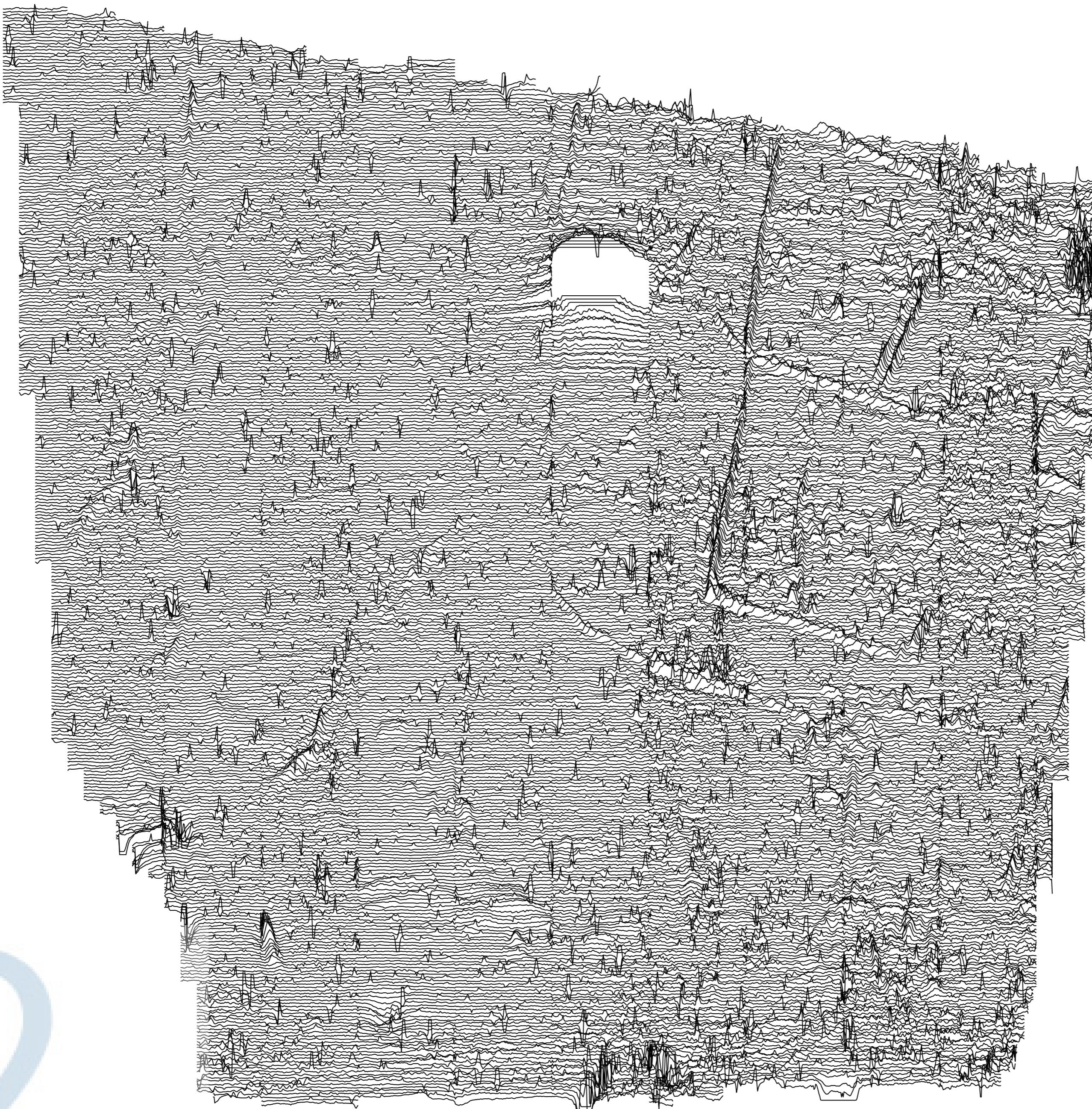
Title: GO0AF Magnetometer Survey
Interpretation

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CH-004-14.19

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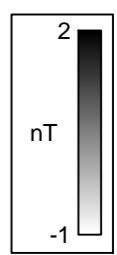
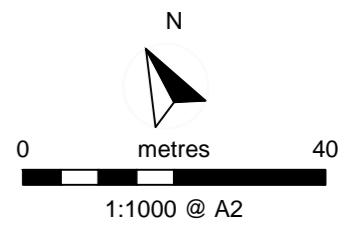
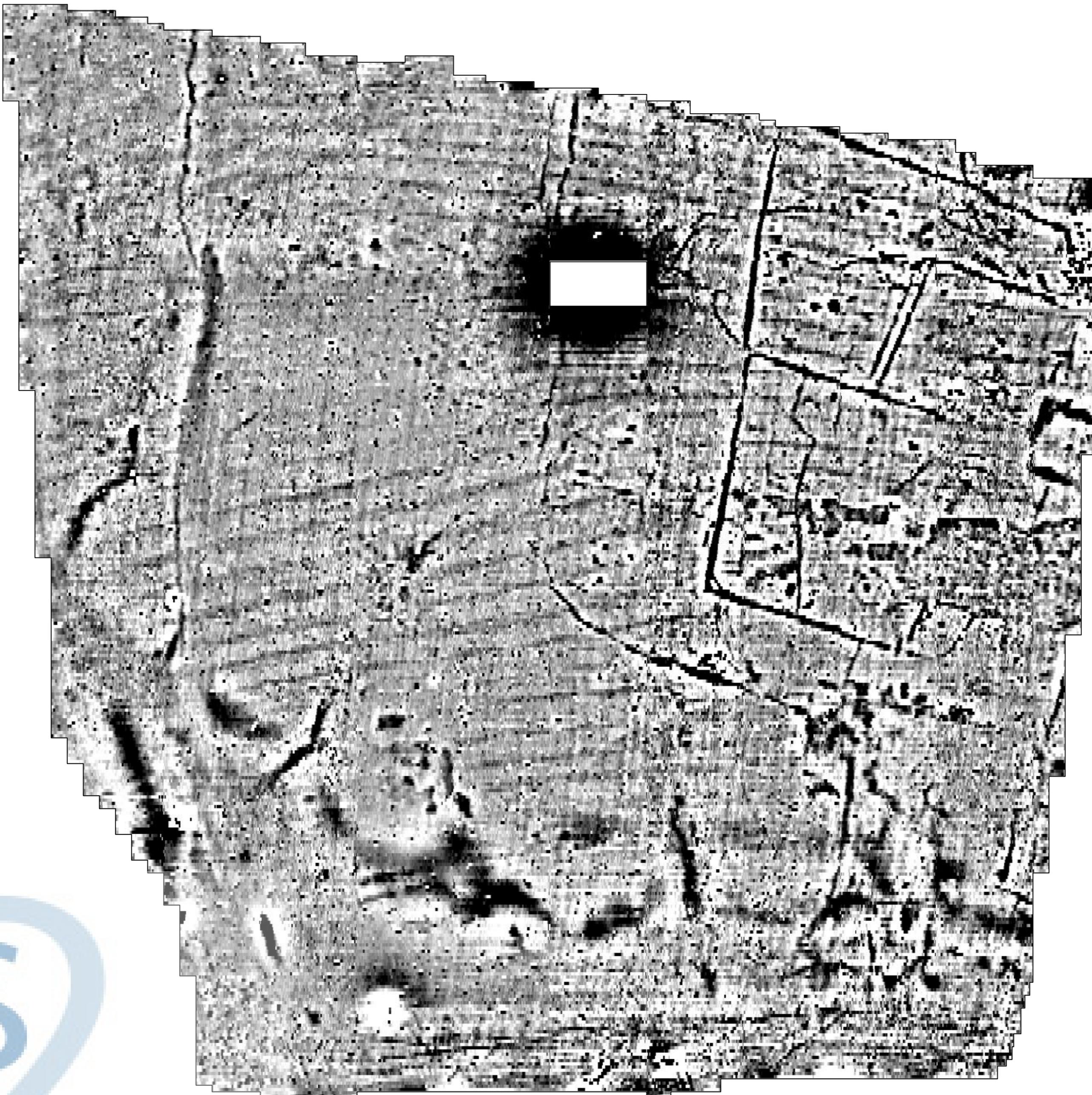


15 nT

Y axis plot scale: 15nT/cm
Clip levels: +/-15nT

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Project: G1317/5 HS2: C252 Country South CFA14 GO0AF Illet's Farm	
Title: GO0AF Magnetic Data - Area 1: XY Trace Plot	
Drawn by: ELWood	CH-004-14.20

hs



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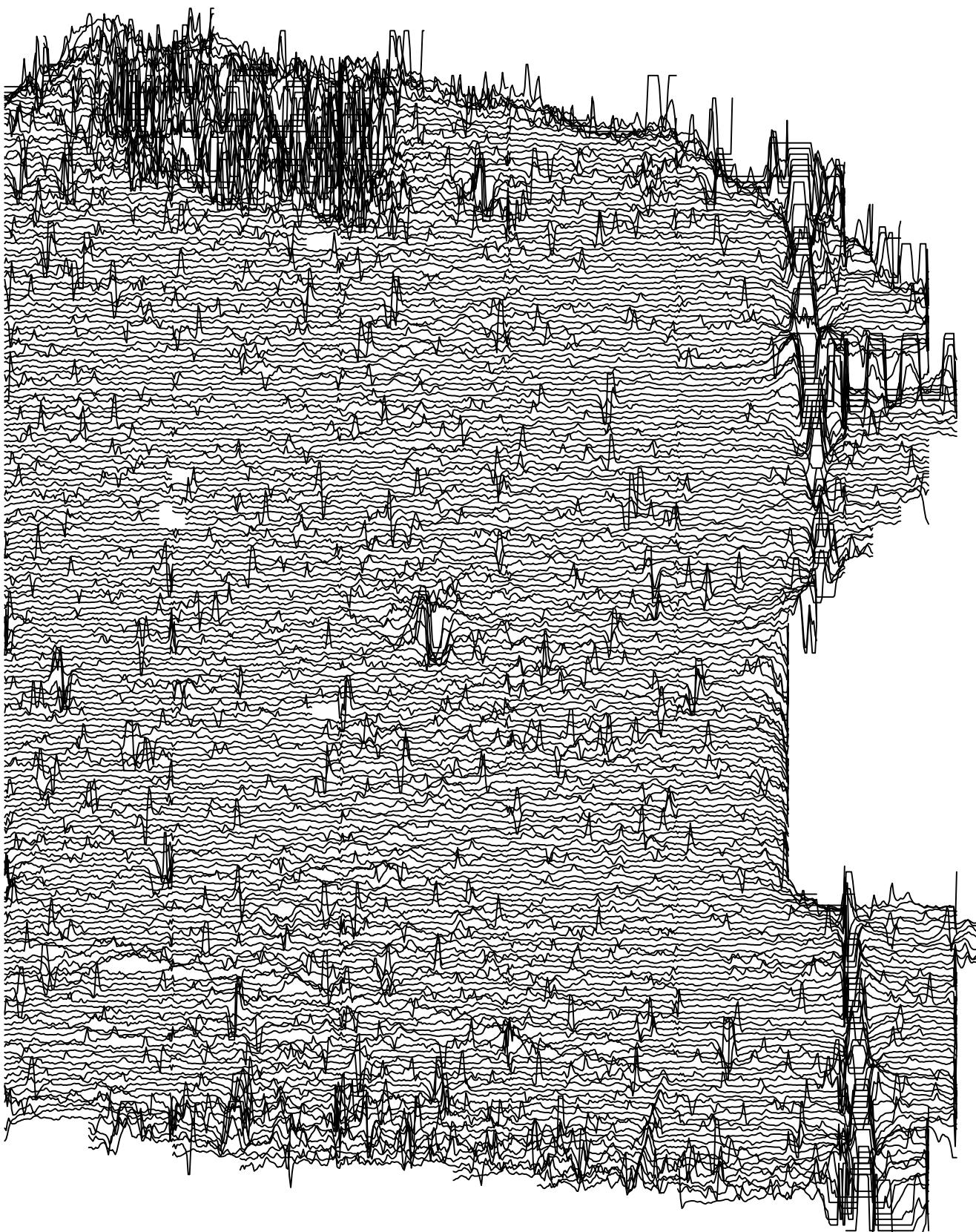
Project: G1317/5 HS2: C252 Country South
CFA14 GO0AF Illet's Farm

Title: GO0AF Magnetic Data - Area 1:
Greyscale Plot

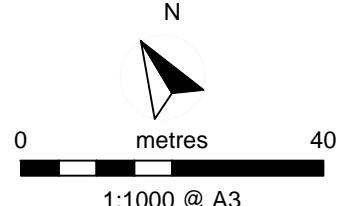
Drawn by: ELWood

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15 nT

Y axis plot scale: 15nT/cm
Clip levels: +/-15nT

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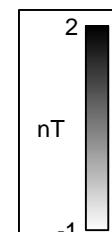
Title: GO0AF Magnetic Data - Area 2:
XY Trace Plot

Drawn by: ELWood

CH-004-14.22



N
0 metres 40
1:1000 @ A3



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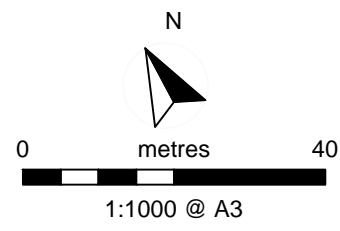

Project: G1317/5 HS2: C252 Country South
CFA14 GF0AF Illet's Farm

Title: GO0AF Magnetic Data - Area 2:
Greyscale Plot

Drawn by: ELWood

CH-004-14.23

hs2



15 nT

Y axis plot scale: 15nT/cm
Clip levels: +/-15nT

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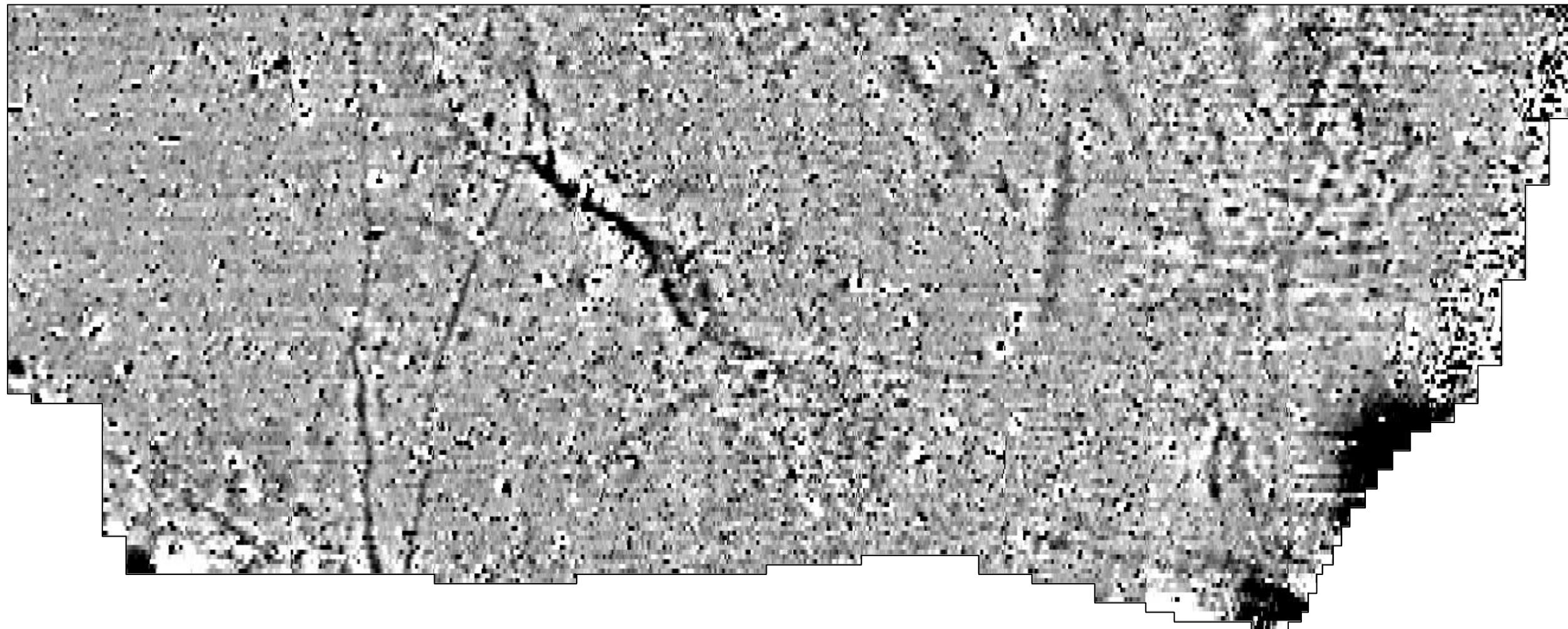
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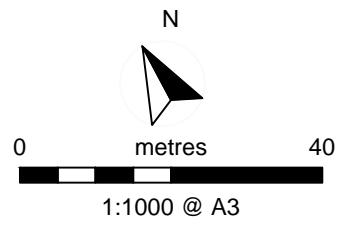
Title: GO0AF Magnetic Data - Area 3:
XY Trace Plot

Drawn by: ELWood

CH-004-14.24



hs



0 metres 40
1:1000 @ A3

15 nT

Y axis plot scale: 15nT/cm
Clip levels: +/-15nT

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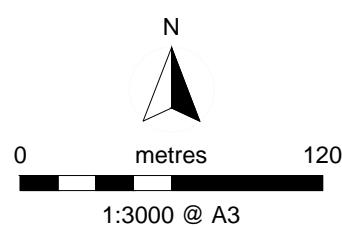
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Project: G1317/5 HS2: C252 Country South
CFA14 GO0AF Illet's Farm

Title: GO0AF Magnetic Data - Area 3:
Greyscale Plot

Drawn by: ELWood

CH-004-14.25



Selected GPS Points



30m Grid Division

The above GPS points are raw RTK co-ordinates. If re-establishing the grid or setting out trenches please use points A and B (pylon bases) for reference.

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Title: GO0AF Tie-in Diagram

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Drawn by: ELWood

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